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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

The Premier at Stoke-on-Trent Gas-Works.

THE catholic interest of the Premier in the industries of the country was again exemplified by his visit (accompanied by Mrs. Baldwin) to Stoke-on-Trent last Friday. The object of the occasion was for him to receive the freedom of the city, and to inaugurate the centralization of gas manufacture at the Etruria works for the six federated towns of Stoke, Hanley, Tunstall, Burslem, Fenton, and Longton. The whole gas industry will appreciate the honour the Prime Minister did it in journeying so far, and devoting a day from his multitudinous duties and engagements, to introduce into formal operation one of the evidences of scientific progress in our industry and of the application of the policy of productive consolidation, whereby comparatively small manufacturing units have been welded into one with the resultant economies and efficiencies. This is distinctly in consonance with current political and industrial views. It is no small thing the City of Stoke has done in bringing the head of the Government into actual contact with the work of the gas industry, from which, as he said during the proceedings, "we expect a great deal in this country." The same words might have been uttered many years ago. Had they been, there would have been fulfilment during those periods of great crises for the nation—the years of the war and the devastating coal stoppages. Even without those unpleasant chapters in our history, any expectation has been abundantly met by the day-to-day service the gas industry renders to the community in both domestic and industrial life. Political recognition of the normal and exceptional services of the industry, and of the important part it takes in the development of the properties of our coal—releasing and placing them in serviceable form for utilization—has not hitherto been of a conspicuous nature. But the Premier has been to Stoke, has seen a worthy object-lesson of what is being done, and from it has the assurance that any expectation that is entertained regarding the future work of the industry, as a long-established and highly essential participant in our communal system, will receive materialization to the full.

As already said, consolidation of production is a political and industrial policy which is being put into practice in all directions. Parliament has favoured it, has insisted upon it in the electricity supply industry. It has been adopted in the railway world; the water supply of the country is administered over wide areas by central authorities. Industries and commercial undertakings have found the benefit of production and trading through larger concentrations rather than by small units. It is a process that has been proceeding for a long time, but it has in latter years been developing on much larger and more influential scale. There are, however, bounds to this. The gas industry, for instance, is not one which on its productive side could conveniently be merged into a national unit, as has been done in the electricity supply industry. In the case of the gas industry its fundamental raw material is coal; but from that one material it has a plurality of products, which are required by the community throughout the country. Better, therefore, to take easily handled coal to gas-works supplying convenient and reasonably sized areas, and produce locally, than have to transport a variety of products to every quarter of the country from fewer centralized producing stations. The Premier will see from this a great distinction between the gas industry and that supplying the single product—electricity—from coal or other fuel. In other words, even in the policy of centralization of production, there must be limitations in application to industries according to their nature, service, and obligations. No definite rule can be laid down; circumstances alone can define.

Probably the point has already impressed the Premier after his visit to Stoke, and the acquaintance he then made with modern progress in gas-works processes, and in the ideas of the gas industry as to what constitutes an excellent scheme of gas-production centralization—in this instance, as planned and carried out by the Chief Engineer and General Manager (Mr. Alexander MacKay). Though Mr. Baldwin's life is devoted to politics and to the higher administrative service of the country, he is not a stranger to engineering; and he could therefore look upon the plant with the trained eye of an expert. As he viewed the carbonizing plant—the Glover-West verticals and the horizontal settings operated by Drakes' charging and discharging machine, all the auxiliary coal and coke handling equipment, and the multifarious apparatus which represents the processes subsequent to the production of the crude gas, and on to the chemical plant, he must have detected engineering skill, the refinements of scientific practice, and the economies and efficiencies of our modern operations. In the chemical works, he saw the processes of developing the important secondary products; at the boosting plant he learned how gas is transmitted at high pressures to distant places. He saw how the gas maker by his modern methods separates coal into its various elements, and how certain of those elements are worked-up or divided into other valuable commodities for the service of man and industries. We repeat it was an excellent thing to have brought the head of the Government into contact with all this. We congratulate the Stoke-on-Trent Corporation upon that; we also congratulate them, the Gas Committee, and the Chief Engineer and General Manager upon the consummation of a gas manufacturing centralizing and transmission scheme which has belted together the six towns now constituting the city. It testifies to great engineering skill, and to an administrative ability and enterprise which prove that the local government of the city is in wise and safe keeping. A descriptive and illustrated account of the proceedings last Friday appears on later pages.

Rate Relief Effects for the Gas Industry.

"A bold and constructive Budget" was the general verdict on Tuesday night and Wednesday morning last week. This applies to the chief features of the scheme of the Chancellor of the Exchequer for the relief of productive industry from local rates; the means by which the relief is to be financed had not such universal approval, and will be fought—probably fruitlessly—right through the piece, until the Finance Bill is on the Statute Book. It is agreed on all hands that the burdens of productive industries have been increasing year by year, and that it is time something is done to ameliorate them, so as to give more freedom in the competition with trade rivals abroad. Though we always regarded the gas industry as a productive one, it, in company with electricity and water, is deliberately shut out by Mr. Churchill from participation in the scheme. The gas industry could do with some relief from the burden of rates; but we do not suppose that it will make any fuss over the decision that it is undeserving, or in less need than others. The gas industry recognizes that it relies largely upon the general prosperity of the country, and anything which can be done to increase it the better for the gas industry. It is from that aspect that the scheme of the Chancellor will be considered by gas men, and the more they explore it, the more they will see that, though gas undertakings are not to be direct beneficiaries, the operation of the scheme should be of immense service to them. If the relief promotes greater industrial activity, the gas industry's products will be in greater demand. The coal, iron and steel, and the other heavy industries (including our own plant manufacturers) will directly and indirectly benefit; and this should react to the benefit of gas-supply undertakings generally. The relief to the freight-carrying railways, canals, harbours, and docks will be valuable. In the case of these, it will only be afforded conditionally on their making an equivalent reduction in transport charges wherever practicable. The allocation to the railways, it is estimated, will certainly not be less than £4,000,000 a year, and of this about one-fifth will go to benefit agriculture, and the other four-fifths will be concentrated upon these traffics: Coal, coke, patent fuel, mining timber, ironstone, iron ore, and manganese ore, and limestone for blast furnaces and steel works. The relief, it is calculated, should afford a reduction of about 8 p.ct. on these selected traffics. In view of the heavy custom of gas undertakings with the railway companies for conveying coal and coke, an 8 p.ct. reduction of cost, particularly in view of its continuity, will be welcome. The relief, of course, will give the railway companies an advantage over road transport, and those concerned in the latter are strongly—and naturally—protesting against the dual handicap of rate relief for the railways and a tax on imported motor spirit for road vehicles. Perhaps the new conditions will have a good effect on the use of coke for heavy motor vehicles. It may be conveniently mentioned here, in connection with motor vehicle duties, that there is to be a rebate of 20 p.ct. on goods vehicles exceeding 2 tons fitted with pneumatic tyres.

The scheme provides that the various productive industries which are to participate in it shall be relieved of local rates to the extent of three-quarters; while agricultural land and buildings are to be relieved of all rates—the farmer henceforth only paying the rates on his house in the ordinary way. It is computed that the total cost of the rate-relief scheme for productive industry and rail distribution of certain basic materials and agriculture will be, when fully developed, about £29,000,000 a year. It is hoped that something like two-thirds of this (with a progressive increase) will be raised by a tax upon the lighter hydrocarbon oils—petrol and other forms of motor spirit, kerosene, and white spirit—which are imported or derived from imported materials. The heavy oils—fuel oil, Diesel oil, and gas oil—are excluded. All home-produced spirits or oils from indigenous products will be free from any countervailing excise. The tax on imported petrol or other motor spirit and the lighter oils is to be 4d. per gallon; and as there is no rebate from the horse-power tax, naturally there is a great outcry from motorists. At the same time, they will not, even with the tax, be paying more for motor spirit than in the early part of 1927, although admittedly the present prices of motor spirit are not likely to continue indefinitely when the oil-controlling magnates have had enough of their price-cutting rivalry. By that time, motorists will probably have become accustomed to the tax; and it is not likely to affect the motor industry in any way whatever—any more than did the retail price of motor spirit five years ago, when it was about 2s. per gallon. In this constructive scheme, the 4d. is looked upon as a protection for home producers of motor spirit and light oils, the former, of course, including benzole. It is hoped that it will be an incentive to the greater recovery of benzole, and assist to more rapid development of processes with a view to the greater provision of home-produced oils and spirits. The low-temperature people are already proclaiming the advantage it will be to the adoption of their systems. Thus we see that gas oil is not to bear the tax; and the freedom of home-produced benzole from it will undoubtedly be an encouragement to coal carbonizers to develop recovery, providing a healthier price for crude makes it worth while. The effect upon increased production will depend very largely upon the manner in which the new situation is handled. However, with regard to the revenue which the tax of 4d. per gallon is likely to produce. It was leviable as from last Wednesday; and in the first full year of collection—1929—it is reckoned that every penny per gallon will yield £4,500,000. In the current financial year, it is estimated that the 4d. per gallon on light oils will yield £14,000,000; in the first full year (1929), £17,800,000; and thereafter the revenue will rise year by year by about £1,250,000.

It is clear that this is not a temporary expedient in respect of rate relief. The scheme is obviously intended to strike much deeper; and upon it we shall see developments. This is evident from one paragraph in Mr. Churchill's Budget speech, which we will quote:

> Our system of local rating, dating from the Sixteenth Century, is wholly inapplicable to modern industrial production. The practice of levying local taxes on the tools and plants of production is, in its nature and essence, economically unsound and even vicious. The rates enter directly into the cost of production, and affect our competing power at home and abroad. They vary in weight in every district, and with the local politics of every district. They fall with progressive severity upon industry in proportion as it uses bulky tools and extensive premises; and, consequently, in rough proportion to the number of wage-earners for whom it provides a livelihood. They fall heaviest upon industry when it is most depressed and making little or no profit, or even running at a loss, and when only a small portion of the plant upon the whole of which it has paid rates is, in fact, in profitable use.

The maturing of the scheme will take time. It is to be developed in three main stages. The first is the gathering-in of the initial money necessary for the relief of the rates upon productive industry. The second is the defining of the scope and the direction in which the relief shall be applied. The third is the reimbursement of the local authorities for their loss of rateable value. As already stated, the first stage is being tackled right away; and the price of petrol has gone up. Benzole (which had had to follow the petrol price war) has also risen. The second stage—the direction of relief—will require a Bill, which will be called the Valuation Ascertainment Bill. This will be introduced by the Minister of Health as soon as possible. It is expected that twelve months will be required after that measure is passed to enable the new valuation to be made for the purpose of de-rating. While this is going on, and when Parliament meet in November, the third stage of the policy will be taken in hand. The Minister of Health will then produce the main Local Government Bill, which will deal with the reimbursement of the local authorities. The forecast gives October, 1929, as the time when the scheme will come into full operation. Meanwhile prominent industrialists tell us that now it is definitely known that something is going to be done for productive industry, it will hearten the heads, and at once have a stimulating effect upon their activities. That this will prove correct is the hope of all who wish to see a greater prosperity and less unemployment throughout the country.

The Price for Clean Coal.

IN technical circles there has lately been a large revival of the question of the cleaning of coal. It is a topic which is always in good favour; and the line of consideration runs along evenly for a time, and then periodically reaches high peaks. We heard a good deal about the need for the reduction of ash at the Coal Carbonization Conference in Birmingham; we have recently had a paper on the subject by Dr. R. Lessing before the Northern Section of the Coke-Oven Managers' Association; and we see the South Staffordshire and Warwickshire Institution of Mining Engineers have had before them a paper on "The Dry Cleaning of Coal," by Mr. A. N. Harrison Slade, of the Coal Treatment Laboratory of the Birmingham University. We all know the uneconomic inflictions of a high ash content in coal. There are the transport costs for useless material, high capital outlay for retorts or ovens and handling plant, excessive operating expenses, and loss in products and in the value of some of them—coke in particular. It is a pernicious state of things, which commences at the source of the production of the coal and ash. In his paper, Dr. Lessing stated that the equivalent of about 1200 coke-ovens was kept going throughout the year for heating refuse to a coking temperature. The same applies to gas-works retorts. In view of this it is not surprising to find Mr. Slade saying that the demand for cleaner coal has been growing for many years, and is on the increase.

There are only two things which are likely to induce the colliery owners universally to clean their coal. One is that the demand of the buyers for clean coal—especially the gas, coke, and power undertakings—is such that an intense competition is created between the coal producers; and the other is that they are paid fully for the loss of vend—the percentage of refuse material which they will not sell but do so now—*plus* the cost of the removal of the ash. Regarding the first point, it is clear that those colliery owners who can deliver uniformly clean coal will, as Mr. Slade points out, have an indirect advantage over their less progressive competitors by reason of more regular demand upon, and therefore working of, their collieries—thus increasing, or at any rate maintaining, output, and possibly securing higher prices for their product than formerly. Probably "indirect advantage" might be translated into "direct advantage," when consideration is given to the statement of the Chairman at the same meeting (Mr. L. Holland) to the effect that there is a great deal the colliery owner might lose if he does not clean his coal. He knows of more than one colliery which could not have carried on if some means of cleaning coal had not been established. From the buyers' point of view, this means that they can exercise some amount of pressure by buying only coal the ash content of which does not exceed a certain figure, thus leaving on the hands of the producers the coal that shows an excess, and so compelling them to cleanse it.

This brings us to the second point, as to who shall pay the cost of cleansing from ash. The colliery people assert the buyer must. Prof. H. Louis says that there is no difficulty to-day in cleaning coal down to within 1 p.ct. of the intrinsic ash. Sir Alfred Mond said the same thing at a recent meeting of the Institute of Fuel; and Dr. Lessing can give confirmation. Prof. Louis says the collieries would clean the coal to this low percentage if those who bought it would pay for the cleaning, the average cost of which, taking all in, would be something like 6d. per ton. But it is clear that the colliery owners have more exalted views as to the part the buyer shall take in paying for the cleaner coal. Not only must the cost of cleaning be paid by the buyer, but the loss of vend must receive compensation from him. What was rubbish, and was paid for at the same price as for actual coal, when it is displaced by coal must be paid for extra. It seems Quixotic; but there it is. This was made abundantly clear at the meeting at which Dr. Lessing read his paper, and at that at which Mr. Slade submitted his. The Chairman at the former was Mr. J. Curry; and he said that, if the colliery people were able to supply coal with from 6½ to 7 p.ct. of ash against 9 to 9½ p.ct., it might bring the costs up by about 1s. 3d. per ton, as probably the vend would be reduced to 90 p.ct. Assuming the coal was costing 13s. per ton, it would then be 14s. 3d. Prof. Louis, who had put (as already stated) the cost of cleaning at 6d. per ton, said that if coal cost 10s. per ton and 10 p.ct. was taken out of the vend, this would mean 1s. to be added to the 6d.—thus making 1s. 6d. per ton. Mr. Slade also regards the reduced vend as serious, seeing that dirt has to be removed to anything up to 20 p.ct. of the amount brought to the surface and paid for.

That is the position; and it is not a comfortable reflection that it may be aggravated as machine mining and loading increases. It is declared by Prof. Briscoe that the competition as to who should have the "profit" to be derived from coal cleaning has considerably hampered the adoption of the process; but Prof. Louis considers that there is sufficient margin if coal users and producers will only play the game, and arrange to divide the profits to be obtained from the process. Of course, there is value in the reduction of the ash to all coal carbonizers; but we are afraid that it will be difficult to persuade them that they should pay not only for the costs of cleaning the coal, but provide compensation for the difference occasioned by the coalowners hitherto selling something that was not coal as that substance, and selling something that is genuinely coal. This applies especially to public utility undertakings, which have been thoughtfully selected by the owners in certain coal areas as the source of the funds they require for carrying on warfare with other countries to recover their export trade.

The Index and the Consumer.

WHEN there was trouble over gas accounts in the early part of 1927, consumers were exhorted to read their meters and keep a check on their consumption. The advice was good; ready compliance not always possible, even assuming the consumer can interpret the indications of a gas-meter index. The construction of many old houses in which the mass of people live in our cities and towns, and the convention of gas suppliers in the matter of the location of meters, render the task of reading meters somewhat irksome. Take those old houses of Victorian design, the architects and builders of which considered that the proper thing was to create more room in the house by the expensive mode of excavation and building a basement, instead of carrying the structure a storey upwards. In those basements the coal cellars are situated; and the gas suppliers found that the handiest place for putting their meters was on the wall of the coal cellar, without any consideration for the consequences. Their main object was to keep the meter as near the outer service-pipe as possible. The position was about the worst in the house for facilitating inspection; and the best for ensuring a good covering of coal dust and cobwebs. The situation was an insult to a valuable and excellent piece of mechanism. Moreover, it was not easily accessible to the meter reading experts; and we cannot picture the head of the house, or his wife, or his servant, or anyone else climbing over the coal week by week to ascertain how the consumption of gas is going on. Modern houses are somewhat different. Gas suppliers have been prevented from following their old custom of placing the meter in the most ill-conditioned position imaginable, simply because there is no inaccessible place in the modern house, bungalow, or flat. There the advice to read the meter, and so keep control over consumption, can be complied with readily enough, assuming the consumer knows how to read it. When a meter is located where the consumer can inspect it, if he does not learn how to read it, then it is his own fault. Furthermore, if it is accessible to the consumer, it is equally so to the meter reader, and so must save time in carrying out his duties.

We are reminded of this old topic by the recent address of Mr. C. Valon Bennett to the Southern Association of Gas Engineers and Managers. He says the subject is an important one, because so few consumers can read their meters correctly. He not only stresses the inaccessibility of the meter as a reason why there is not a week-by-week check by the consumers, but the difficulty the layman has in learning to read the dials. Mr. Bennett urges that what is wanted is a simplified index—something that can be read at a glance by the inexpert. There have been many

attempts at improvement, but they have never been sufficiently reliable to supersede the old type. In his address Mr. Bennett calls attention to one with which he has been experimenting; and the illustration of it (*ante* p. 42) shows a meter attachment which can be read at a glance. It is worth looking at—and trying. His testimony is that with this attachment it is impossible to make an error in taking the index, and that with it housewives are willing to make the reading of their gas-meters part of their routine work. This is valuable. By its means Mr. Bennett hopes to eradicate dissatisfaction, gain goodwill, and probably increased consumption. He is correct in his opinion that the average man does not mind paying for something which he has had, and which he knows has given him service. Anything which can be done to merit the confidence of the consumers is worth while; and this matter of more easily read indices should have serious consideration.

The Weyman Fund.

Although the appeal for contributions to this fund has only recently gone out to individuals and firms, the Treasurer has received about twenty subscriptions, ranging from £250 to 10s. 6d. Two large contracting firms have subscribed £50 and £25 respectively. It is a gas company who has contributed £250; and individual subscriptions range from £21 downwards. Much appreciation has been expressed by all concerned at the initiation of the fund, as Dr. Weyman's work is so widely and highly esteemed. The Council of the Institute of Chemistry are lending their heartiest support to the fund, and will act in conjunction with the Trustees. It is proposed to publish a list of the subscribers, though not of the actual individual subscriptions.

Coal-Marketing Schemes.

The artificial conditions which have been imposed by the coal marketing schemes do not seem to be working out well, through demand not being willing to submit to the rules which have been laid down for supply. The promoters of the schemes do not appear to have legislated for that. There was some criticism of the Midlands coal-marketing scheme at the annual meeting of the Hull Coal Trades Association last Thursday. The Secretary (Mr. Albert Wyer) acknowledged that he was a sadly disillusioned man. Two main points had carried the coal exporters along with the coal owners. One was that there would be an increased flow of coal for export; and the other that everything humanly possible would be done to minimize periods of booms and slumps. The position to-day was that an artificial boom had been created in coal prices, brought about by a restrictive policy. This was confirmed by the President (Mr. Walter Bell), who said the reverse of an increase in exports had been the case; while Mr. T. H. Stone alleged that orders were going from the district through collieries reducing time and output. Of course, if buyers—home or foreign—cannot readily get what they need from one area, they will naturally go where they can fill their requirements. So far as the export trade is concerned, the scheme itself may defeat one of its primary objects, unless remedial measures are promptly applied. Since the meeting referred to, there has been admission on the part of certain colliery owners that the scheme has started on too low a quota; and it is understood that an effort is to be made to relieve the shortage of coal for export by increasing the quota. The fact shows how little foresight was exercised in making the preliminaries. It would have been far better to reduce output gradually than to have to retrace steps. The pressure of short output has had a little effect on prices in the upward direction; but the same short output has meant loss of business. This is an indication of bad generalship.

Household Coal.

In another quarter, we see that householders are being urged to buy coal during the summer, on the ground that the new coal-marketing schemes will cause a decided scarcity of house coal during the winter.

Nitrate Demand.

A message from Santiago states that the Chilian Government, anticipating an increased demand, are preparing to hand over for exploitation unexplored nitrate fields with a total capacity of 10 million tons, where it is planned to instal plants capable of producing 500,000 tons annually. These will soon be ready to begin operations. It is also proposed by the Government to give two other concessions of similar capacity. This year's production, it is calculated, will exceed 3 million tons; and experts are confident that expansion, together with improved methods, will soon bring the annual production up to 5 million tons, which, it is believed, will be enough to meet any increase in the world demand.

Miners' Industrial Union.

The controversy regarding the rival miners' unions in the Notts coalfield shows no abatement. The coalowners a week ago issued a statement repudiating the ballot proposed to be taken by the Trade Union Congress, and announcing that they intend to stand by the Industrial Union. They will neither upset nor interfere with the agreement under which the members of this new organization are working. It appears to many disinterested onlookers that the General Council of the Trade Union Congress are in this matter trying to play a double game. They are forcing the ballot forward, notwithstanding the refusal of the coal owners and the Industrial Union to have anything to do with it. They know very well that no ballot in such circumstances can have any reliable result. On various occasions the Council have denounced Communism and the Minority Movement, and have advised all true trade unionists not to recognize them in any way. Yet in Nottinghamshire, they are supporting a branch of the Miners' Federation, which, as the whole world knows, is dominated by the extremist element. The Council are also out for peace in industry, as a means of promoting development which will be of value to all concerned. But, on the other hand, they are now supporting one of the most militant sections of trade unionism which has done more harm to the country, its trade, and employment than all the other sections put together. It is time the Council examined their own position from the point of view of how the general public regard the singular contrasts in policy which their actions provide.

PERSONAL.

Mr. W. H. Warren, of the Gas Light and Coke Company, is the new Hon. Secretary of the Southern Association of Gas Engineers and Managers (Eastern District). In future, communications should be sent to Mr. Warren at the Gas-Works, 109, Nine Elms Lane, S.W. 8.

One of the new West Riding Magistrates is Mr. Philip B. Nicholson, of Wath-on-Dearne, Hon. Treasurer and Past President of the Coke Oven Managers' Association, who has had another honour conferred upon him in being invited to contest the seat of the present Labour Member for the Wentworth Division of the West Riding (Mr. G. H. Hirst) in the Liberal interest. Mr. Nicholson is the Manager of the coke ovens and bye-product plant of the Cortonwood Collieries, near Barnsley, and recently became Chairman of the Wentworth Parliamentary Liberal Association. He is a member of the Managing Council of the British Road Tar Association.

Mr. J. Boxhall James, of the Cardiff Gas Light and Coke Company, has been successful, out of a very large number of applicants, in obtaining the appointment of Assistant Secretary and Sales Manager to the Preston Gas Company. Mr. James has received the whole of his training in the Cardiff Company, and is exceedingly popular, not only among his colleagues, but in the social and public life of Cardiff. He is a keen amateur sportsman, and was for many years Hon. Secretary of the Cardiff Corinthians Association Football Club—the most famous Welsh Amateur Combination. Mr. James will leave for Preston with the good wishes of a very large circle of friends in Cardiff.

Mr. T. Huntley, of the Cardiff Gas Light and Coke Company, has been successful in obtaining the appointment recently advertised of Superintendent at the works of the Oxford Gas Company. Mr. Huntley received his training at Cardiff, being Technical Assistant at the Grangetown Works. He has passed the Institution's Higher Examination in Gas Engineering (First Class).

OBITUARY.

We are sorry to learn of the death on April 30, in a nursing home following an operation, of Mr. Walter R. Wilson, Engineer and Manager of the Borough of Kendal Gas and Water Works.

ELECTRICITY SUPPLY MEMORANDA.

READING between the lines of a statement made by Mr. A. F. Berry, at the annual meeting of the British Electric Transformer Company, the Tricity Restaurant business at the well-advertised place in the Strand, has not, even with its attractions other than food cooked by heat obtained from electrical energy, yet achieved such financial distinction as to enable the shareholders of the Company to applaud the venture. In some directions there have been attempts to boost-up this electric-cooking advertising stunt by talking of dividends of the order of anything between 15 and 30 p.ct. But Mr. Berry warns against building hopes too high. "Such a rate of dividend, or any dividend at all, in its earliest days is unthinkable." That's that; and the Company are the principal shareholders in the restaurant. The best thing Mr. Berry can say of the business is that it has developed, and is developing, at a steady rate, and "apparently" fills a want in London life. We have never observed a rush of London life into the place, and yet are constantly in proximity to it; nor do we know of anyone who has visited it. Probably in the prices which are charged for meals there, compared with gas-run restaurants near-by, we have an explanation; the prices may be above the "market" ones for Strand diners. According to the report of the meeting in "The Times" Trade Supplement, Mr. Berry also confessed that "it might be that they, the Transformer Company, with their many activities, were not the proper parties to develop the 'Tricity' restaurant idea to the extent of opening-up in other parts of London and provincial centres as had been suggested." Evidently the Directors have been learning wisdom from experience, which is an excellent thing. A further suggestion was that it would benefit in every direction, as well as tend to increase the dividend prospects, if the majority of the 3000 shareholders would take an interest in this cooker section of the business, instead of leaving it for the minority to do so. We are pleased to learn that so much sense rules among the majority of the shareholders.

Slow Progress at Tricity Restaurant.

A Slowing Up.

There were other admissions on the part of Mr. Berry; and to an extent they confirm the statements that have reached us from various electrical quarters that the demand for electric cookers in some areas, and the return of cookers from consumers, have reached a point when the electricity undertakings find it impossible to place orders for further supplies. Mr. Berry says that the electric heating and cooking business was slowed up badly for several months in the early part of the year, and has barely recovered yet. Instead of being pressed for still more rapid delivery of cookers "which had been called for by the thousand," the Company were asked to hold up delivery in all directions. Mr. Berry, however, comforts the shareholders by pointing out that, with better and cheaper fuel competing, the electricity industry is getting back to the policy of cheaper and more reasonable rates for domestic supply. Of course, gas, coal, and coke are all at lower prices; and this adds to the difficulties of electricity. But Mr. Berry is optimistic. At the moment, apart from strenuous competition, there are signs and indications that the Company have surmounted the worst of their difficulties. The "strenuous competition" will remain. But all this shows that heat obtained from electricity by a complicated process and means is not sufficiently attractive. It must be brought down to as low a figure as heat obtained by any other means; heat being no better electrically derived than that from other agents. It is, however, highly questionable whether much of the electricity that is to-day supplied for heating and cooking is not being sold at prices that bring no profit to the electricity undertaking. How can it do so when it does not more than pay for the coal expended on its production? But it is not only the cost of electricity for heating and cooking; it is the expense of the appliances, their installation, and upkeep that is another drawback. And people in the industry are ever making a point of this; but with little effect upon the manufacturers. It cannot be expected that, with the simplicity of gas cookers and other appliances, and the large demand there is for them, the makers of electrical goods, which are more complicated organically, will ever be able to reduce their prices to equal levels for appliances of corresponding range and capacity. It is the recognition of this that induces the journalistic counsellors of the electricity industry and others to urge the development of the system of hiring-out appliances. But those counsellors are not the ones who have to provide the capital, and suffer the distress of seeing the appliances returned to store when users have had experience of their limited range compared with the gas cooker.

Marring England's Beauty.

The Earl of Crawford and Balcarres, in addressing the Geographical Association at Oxford, on the 16th ult., made strong complaint of the degradation of the scenery of rural England that is proceeding in the present day. He says there is a tendency to destroy the beauty of the countryside by the erection of hideous and ungainly things called petrol pumps. He asks why, when he wants to buy petrol, he should have to gaze on a pillar of orange, red, or green. The owners of these have got an idea that because a thing is orange, red, or green, it makes impact not only on one's eye, but upon one's mind. He declares that all this offensiveness is absolutely meaningless. If this is the view of the noble earl on the subject of petrol pumps, we are wondering what he will say when he comes to pass through the countryside, and have his eyes offended by huge standards 80 ft. high and 16 ft. square at the base carrying the cables for the transmission of electricity under the Government scheme. He will probably have to fortify his vocabulary in order to express fitly his sense of indignation at the new desecration of our rural scenery.

Experiences of Mrs. Wilfrid Ashley.

Mrs. Wilfrid Ashley, wife of the Minister of Transport, has been elected President of the Electrical Association for Women. At the recent annual meeting, she said she could boast of not having a single lump of coal in her house—all heating being by electricity; but she confessed that she still finds the electric cooker too expensive. If all heating is done by electricity in the house throughout the winter, including water heating, then all we can say is that the total cost must be enormous. Probably, however, few people other than Ministers of the Crown could afford to pay such a bill for domestic heating by electricity. We are not sure that it was altogether a wise thing to flaunt the possession of wealth and the ability to pay for the most expensive method of heating extant in the faces of even members of the Electrical Association for Women. However, it is interesting to find that, though "all" heating is done in Mrs. Ashley's house by electricity, she finds the electric cooker too expensive. If that is too expensive, then we fail to understand the reasoning which allows the house to continue to be heated entirely by the electrical mode. However, seeing that the Minister of Transport had so much to do with the passing of the Electricity Act of 1926, his wife is hoping that, when the great scheme is fully in operation, every woman will be able, not only to light and heat her house by electricity, but to cook by it. We can assure Mrs. Ashley that her hope will never be realized while electricity can only be generated at an efficiency of 20 p.ct. or under, and the value in heat given by it for the money expended is what it is to-day, or likely to be under the new régime. We do not know what Mrs. Ashley meant by the cryptic statement: "We want the time to come when we and every one else will be able to gain the joy of living for 2½d. a day." Evidently it has something to do with electricity, inasmuch as she added: "If electricity can do that for us, then let us boost it in this Association for all we are worth." Although the Minister of Transport has told his fellow politicians that there is ample room for both the gas and the electricity industries, it is clear that, if Mrs. Ashley's hope is realized—that every woman will be able to heat and cook by electricity—the gas industry would have to go out of business. But we can assure her that it has no intention of doing anything of the kind.

Public Lamp Conversion.

"Meteor" of the "Electrical Times" announces that "all over the country progress is being made with the conversion of gas lamps to electric lamps in the public streets; the enemy is being worn-down by a process of steady attrition." The falsehood in that statement is found in the words "all over the country." Nothing of the kind is happening. If "Meteor" will only take the trouble to consult the official statistics of the Board of Trade, he will ascertain that the number of public gas lamps in Great Britain is being maintained, despite the petting of municipal electricity undertakings where private gas supply is in competition. We should like to ask "Meteor" to state the number of towns where all-electric public lighting exists in which the electricity supply is a municipal possession and not the gas supply; the number in which the same condition obtains in which the municipality owns both the gas and electricity undertakings; and the number in which it is found with both supplies company possessions. The analysis would be an eye-opener for our flighty friend. He might also ask Mr. Haydon Harrison how many miles of the roads and streets of Great Britain are lighted by gas-lamps, and how many by electric lamps. The comparison would be valuable, when it is remembered that electric lamps were first seen in a London thoroughfare some sixty years ago. That gas lighting should be described as the "enemy" is perhaps rather a compliment. It shows that it is something more than a readily suppressed business rival. The fact of the matter is that electricity can only make substantial progress in the streets where it is favoured through the supply being a municipal concern which has to fight for business in opposition to private gas supply. There are good reasons for the little reduction that has taken place elsewhere. Public illumination is not improved by making a change to electricity when modern gas lamps are installed and properly

maintained. Disinterested persons, too, find that electric bulbs quickly lose in efficiency; gas-lamps can be maintained, and there is not the same light depreciation. What is more, there is not the same liability to wholesale extinction with gas as with electricity. The police have to be always ready for electrical collapses; and many public lighting authorities are sickened by the fickleness of the electric supply. They do not regard the dependable gas lamp as an enemy. It is the staunchest street-lighting friend of which they know; and the best protector of the public in these days of fast moving traffic. The costs and losses that electricity imposes as an illuminant by its unfaithfulness, apart from the expenses of installation, improvement, maintenance, and running, are not negligible. But even these things will not prevent the cock-crowing from the offices of the "Electrical Times" on the slightest encouragement being given.

Dangerous Wirers.

The registration of electrical contractors does not make great headway. This is a pity. Some of the principal firms appear to think it is not worth their while to become registered; their reputation is sufficient for them. Some of the worst firms —those who deal in shoddy wiring, and are a menace to the electricity business—do not think it worth while to apply for entry upon the register of the elect because they know they would not succeed. The net number of contractors on the register at Dec. 31 last was 1049. The total number of applications for registration since the inception of the register is 1348. Of these 148 were declined, and 23 were withdrawn. Three applicants have requested to have their names withdrawn; two have been struck off for bad workmanship; and others through the closing down of businesses, bankruptcy, and other unfortunate causes, which suggest a superfluity of contractors in the electricity industry. But there are those 148 applications which were declined; and there are the host who have not made application. How many of them are still engaged in work detrimental to the industry? No one knows. The register is limited in its value while this condition continues. Why not have a register of undesirable contractors, and publish the list? No risk would be run other than that of trade defamation actions. Our contemporary the "Electrician" the other day published a page of illustrations of some of the most remarkable wiring atrocities we have ever seen. Four of the illustrations showed samples of wiring in a church; another was an example taken from a private residence; and another was discovered in an old country mansion. The comment of our contemporary is: "Without this definite pictorial evidence, it would be hard to believe that such work can be done, paid for, and utilized in a civilized country. As to the authenticity of these grotesque conglomerations of materials, there can be no doubt. They constitute a constant source of danger to the public, and bring discredit upon *bonâ fide* electrical installation contractors and the suppliers of the materials alike." And then if "it is believed that the fire was caused by an electric fusion," the electrical papers boil over with a wrath which they know is unjustified, and as a matter of fact has no reality—only meaningless word expression.

Electrical Afterthoughts.

An esteemed correspondent calls our attention to a criticism of electrical methods which appeared in the "Municipal Journal" for April 20. There is a great deal of truth in what is said. The paragraph reads: "Visitors will vainly search the Building Exhibition for evidence that the electrical contractor believes that his interests are linked with the builders'. Domestic electrical apparatus is rightly found at electrical exhibitions; but the material by which the current enters the house and is distributed at the proper points belongs to the earlier—not the later—stages, while the house is in 'carcase.' Plumbers and gasfitters work with the builder; electricians hinder the painter and decorator. Most electrical installations seem like afterthoughts, and not integral parts of the structure. Quick wiring tricks—twin lead-coated cables, clips, cleats, staples, bonds—mean lack of vision, not efficiency. Why should switches be untidily screwed to a wall when they might be parts of specially designed units or panels, or main switches and fuses and distributing boards be ugly excrescences half hidden in positions which make them inaccessible? The ubiquitous wooden block on which much gear is mounted ostensibly serves as insulation: in practice it is a convenient plaster for the scars caused by electricians." The pride of some electrical contractors in their methods will be somewhat disturbed by such open, justified, and disinterested criticism.

Mishaps.

A beautiful residence, "Ingleholme," situated at Eccleston Park, Prescot, was burnt down last Saturday week. The outbreak is "believed" to have been caused by an electrical fusion in a servant's bedroom at the top of the east wing of the building. The same day another country mansion, Lynford Hall, Thetford, Norfolk, was almost completely gutted. The outbreak is "attributed" to the fusion of an electric wire. Two omnibuses were destroyed and twelve others were badly scorched by a fire on the 19th ult. at the Southern 'Bus Company's garage at Newton Mearns, near Glasgow. The fire "was caused" by the fusing of an electric wire. On the 18th ult., a failure at the Leicester Corporation electricity works caused a cessation of work for about an hour in factories which use electrical power. The whole of the tramcars were brought to a standstill for the same period.

FORTHCOMING ENGAGEMENTS.

May 4.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Annual general meeting in Newcastle, 2.15.

May 8.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Committee.

May 8.—FEDERATION OF GAS EMPLOYERS.—Meeting of the Central Committee.

May 9.—BRITISH COMMERCIAL GAS ASSOCIATION.—Conference of the Midlands District at Redditch.

May 9.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to Messrs. Jacob's biscuit factory, Aintree.

May 9.—INSTITUTE OF FUEL.—Meeting at the Chemical Society's Rooms, Burlington House, Piccadilly, W. 1, at 6 o'clock. Paper entitled "The Engineer in Industry," by Mr. A. J. T. Taylor.

May 10.—SOUTH-WESTERN DISTRICT EXECUTIVE BOARD OF THE NATIONAL GAS COUNCIL.—General meeting at the Gas Offices, Exeter, 2.45.

May 10.—MIDLAND JUNIOR GAS ASSOCIATION.—Annual general meeting.

May 11-15.—SOCIETY OF CHEMICAL INDUSTRY.—Conference in London, organized by the Society in co-operation with its London Section and Chemical Engineering Group and the Institution of Chemical Engineers.

May 16.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meetings of the Executive Committee at 11 o'clock, and of the General Committee at 2.30, at 28, Grosvenor Gardens, S.W. 1.

May 16-17.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Meeting at Bedford.

May 17.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual general meeting at the Hotel Cecil, W.C. 1, under the presidency of His Grace the Duke of Sutherland.

May 18.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to the works of the Rochester, Chatham, and Gillingham Gas Company.

May 19.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Annual general meeting in Edinburgh. Presidential Address of Mr. E. L. Farquhar.

May 19.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Elland. Paper on "Coke" by Mr. R. Crowther.

May 22.—CENTRAL COMMITTEE OF THE FEDERATION OF GAS EMPLOYERS.—Meeting at the Hotel Cecil, 10.30.

May 22.—CENTRAL EXECUTIVE BOARD OF THE NATIONAL GAS COUNCIL.—Meeting at Hotel Cecil, 11 o'clock.

May 22.—FEDERATION OF GAS EMPLOYERS.—Annual general meeting at the Hotel Cecil, 2.15.

May 22.—NATIONAL GAS COUNCIL.—Annual general meeting at the Hotel Cecil, 3 o'clock.

May 23.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, at 2.30.

May 24.—BRITISH COMMERCIAL GAS ASSOCIATION.—Conference of the Cornish District at Truro.

May 24.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring general meeting at Willenhall.

THE INSTITUTION OF GAS ENGINEERS.

All meetings take place in the Council Room at 28, Grosvenor Gardens, unless otherwise stated.

May 7.—Sub-Committee of Gas Investigation Committee, at the University, Leeds.

May 8.—Executive Committee of Gas Education Committee.

May 21.—Emergency Committee.

May 21.—Finance Committee.

May 21.—Luncheon to the President, by invitation of the Council.

May 22.—Gas Investigation Committee in morning; Effluents Committee and Sulphate of Ammonia Committee in afternoon.

June 12.—Council meeting in the Cory Hall, Cardiff.

June 12-15.—Annual General Meeting at Cardiff.

June 14.—Council meeting in the Cory Hall, Cardiff, for the appointment of Committees for the year 1928-29.

July 10.—Gas Education Committee.

Oct. 9.—Gas Education Committee.

Nov. 13.—Executive Committee of Gas Education Committee.

Dec. 11.—Executive Committee of Gas Education Committee.

BRITISH INDUSTRIES FAIR, 1929.—GAS INDUSTRIES SECTION.

Formation of National Committee.

Following upon the success of the Gas Industries Section at the British Industies Fair, Birmingham, in February this year, the Society of British Gas Industries have been in touch with other national bodies in the industry with a view to the formation of a National Committee fully representative of the industry, to organize the Section for the 1929 Fair.

As a result of these negotiations, the following gentlemen have consented to serve on the Committee:

NATIONAL COMMITTEE.

Representing the—	
SOCIETY OF BRITISH GAS INDUSTRIES . . .	Mr. R. B. Hodgson Mr. C. S. Bennett Mr. Cyril G. Davis Mr. E. J. Davison Mr. D. M. Gibb Mr. F. J. Gould Mr. R. J. Milbourne Dr. E. W. Smith Mr. Philip Sugg Mr. H. Talbot Mr. H. M. Thornton Mr. Frank West
NATIONAL GAS COUNCIL	Mr. W. J. Sandeman (One more to be appointed.)
INSTITUTION OF GAS ENGINEERS	Mr. John Terrace Mr. W. E. Price
BRITISH COMMERCIAL GAS ASSOCIATION . .	Mr. F. W. Goodenough Mr. Hubert Pooley
BIRMINGHAM CORPORATION GAS DEPARTMENT	Mr. A. W. Smith Mr. R. J. Rogers

The first meeting of the Committee was held at the offices of the Society of the British Gas Industries, 56, Victoria Street, London, S.W., on Thursday, April 26.

Mr. R. B. Hodgson was unanimously elected Chairman of the Committee, and Mr. A. W. Smith Vice-Chairman.

Mr. R. J. ROGERS (as Hon. Secretary of the Gas Section for 1928) presented a report dealing with the 1928 Fair. He outlined the steps which led up to the formation of the co-ordinated exhibit, and also gave some detailed particulars of the work carried out by the Gas Sub-Committee prior to the Fair. Referring to the results of these efforts, he stated that it was sufficient to say that 16,000 sq. ft. of space was taken by nearly sixty different firms; and the exhibitors were fully satisfied with the results obtained from their participation in the Gas Industries Section.

He thought that in estimating the gain to the industry resulting from this co-operative effort, it was not sufficient merely to consider the satisfaction expressed by the particular exhibitors in the Section. The beneficial results to the industry were more far-reaching than this. The Fair was visited by a large proportion of the business men of the country, and the keeping of the gas industry before them on a scale worthy of its importance must have a definite effect upon their outlook. The Section keeps the gas industry alive in an atmosphere where all competitive agents are displayed, and removes from the minds of all—even from the minds of those competitors—any idea that the gas industry is a dwindling or decaying one. On the contrary, it shows to the world at large the progressive character of the gas industry.

Apart from the advertisement gained at the Fair itself, a very fair measure of publicity was obtained in ordinary newspapers and in technical journals outside the gas industry. The technical journals in the gas industry devoted a large amount of space to the Section and its associated conferences. No doubt this publicity, with the help of the industry's national advertising body, could be still further extended another year.

On the motion of the CHAIRMAN, seconded by Mr. R. J. MILBOURNE, it was unanimously resolved that Mr. R. J. Rogers be appointed Hon. Secretary to the Committee for the 1929 Fair.

The following gentlemen were appointed as a Local Organizing Committee in Birmingham:

LOCAL ORGANIZING COMMITTEE.

Mr. R. B. Hodgson (Chairman).
Mr. A. W. Smith (Vice-Chairman) Ex-Officio.
Mr. C. S. Bennett.
Mr. Cyril G. Davis.
Mr. D. M. Gibb.
Mr. F. J. Gould.
Mr. R. J. Milbourne.
Mr. H. Pooley.
Dr. E. W. Smith.

With power to co-opt representatives of the Fair Committee and others.

It was arranged that a Publicity Committee should be appointed by this Local Committee.

It was reported that 7500 sq. ft. of space had already been booked with the Fair Management Committee by firms desirous of exhibiting in the Gas Section, and that 125,000 sq. ft. of space had already been booked by firms in various industries for the 1929 Fair.

In order that the Fair Management Committee may make adequate provision for housing the Gas Section in one group, manufacturers in the gas industry are requested to forward their applications for space immediately to Mr. R. J. Rogers, at the Gas Department Offices, Council House, Birmingham.

The Committee of the Gas Industries Section for the 1929 Fair will endeavour to arrange conferences on important subjects relating to the gas industry to be held in Birmingham during the period of the 1929 Fair, from Feb. 18 to March 1.

NATIONAL GAS COUNCIL—SCOTTISH DISTRICT.

The Annual Meeting was held in the Central Station Hotel, Glasgow, on Wednesday, April 25, and was presided over by Mr. W. E. WHYTE (Lanarkshire).

The CHAIRMAN said: Since our last meeting the gas industry has again been thrown into difficulty and expense through the actions of the coal industry. In order to suit that industry, certain pooling arrangements have been made, the cost of which is to be substantially transferred against public utility undertakings, such as gas-works. It seems to me that the public utility undertakings are not getting a fair deal from the coal industry. They seem to be held up to ransom on the slightest pretext; and the unfortunate thing is that when the gas industry has to recoup itself for the trouble and expense caused by the coal industry, the public do not appear to realize that its criticism should be directed against the coal industry. The gas industry is no sooner getting on its feet again from a great coal upheaval, than it is plunged into additional expense. It seems to me that the public utility undertakings will, for their own protection, have to take a stand in this matter; and it may be necessary to invoke the assistance of the State to safeguard them against what, in many instances, is an unwarranted passing of coal burdens on to a selected few of the necessary consumers.

ANNUAL REPORT.

MEMBERSHIP.

Company undertakings, 75 (last year 72); Corporations, 42 (last year 44).

GAS REGULATION ACT.

The number of orders granted in Scotland to Dec. 31, 1927, was 32—corporations 28, companies 4. The number is the same as for 1926. The progress of adoption of the Act in Scotland is slow, only one additional undertaking having obtained an Order during the past two years.

The Act applies to gas undertakers; and for the purpose of the Act "gas undertakers" means any local authority, company, body, or person authorized to supply gas by any Act of Parliament, or any Order having the force of an Act of Parliament. The gas undertakers in Scotland coming within the provisions of the Act number 69.

An analysis of gas undertakers in Scotland who have not adopted the Act shows:

Number under 20 million c.ft. per annum	15
,, from 20 to 50 million c.ft. per annum . .	12
,, ,, 50 ,, 100 ,, ,, ,, . . .	4
,, ,, 100 ,, 200 ,, ,, ,, . . .	5
,, above 200 ,, ,, ,, . . .	1
Total	37

The number not adopting the Act is equal to fully 53 p.ct. Of this proportion, 22 p.ct. are works producing under 20 million c.ft. per annum.

ROAD TAR.

The British Road Tar Association was constituted last July, and the Managing Council, representing gas undertakings, coke oven owners, and tar distillers, is now in active operation in forwarding the use of tar for roads. Extensive publicity schemes are in operation, and co-ordination of interests with the Ministry of Transport is being closely followed up. District Tar Boards are being formed; and it is recognized that Scotland has special circumstances and needs as regards its important highways. A Joint Consultative Committee with Surveyors is felt to be necessary; and steps have already been taken to have such a Committee brought into being for Scotland, in order that Scottish interests in the matter of the

use of tar for roads will have attention. It is strongly felt that co-operation with the Highway Engineers' Association of Scotland is most desirable; and in this way the undoubted advantages and preferment of tar over other materials will be maintained. It is hoped that experimental road sections laid with tar will be put down for practical demonstration, proving tar for road making to be efficient and safe for all traffic.

The specification for tar for road purposes has now been improved, and ensures a high grade quality being put on the market. In the matter of quality of tar for roads, it cannot be too highly impressed upon gas-works manufacturing road tar that strict attention to specification requirements is needed if tar is to be given a fair chance in competition with material advocated by other interests.

Scheme for Sale of Tar and Ammoniacal Liquor to Distillers.

The scheme continues in successful operation. There are 132 gas undertakings who are members of the scheme. The monthly awards by the Arbiter are as follows:

—	Tar. Per 100 Gallons.	Liquor (4° Tw.) Per 100 Gallons.
	s. d.	s. d.
1927—April	39 9½	1 6·75
May	38 4	1 6·75
June	38 4	1 6·75
July	38 4	1 6·75
August	39 7½	1 6·75
September	38 3½	1 0·25
October	36 2	1 0·25
November	36 2	1 0·25
December	36 2	0 7·375
1928—January	33 9½	0 7·375
February	31 0½	0 7·375
March	30 4½	0 7·375
Average for 1927–28	36 4·44	1 1·33
,, ,, 1926–27	42 9·08	1 6·75
,, ,, 1925–26	23 10	1 9
,, ,, 1924–25	23 0	2 9·1
,, ,, 1923–24	49 7	3 6·5

Rating (Scotland) Act, 1926—Appeals.

The action of Assesors in disallowing certain subjects, forming the assets of gas undertakings, being considered as part of the undertaking and therefore entitled to the deduction of 20 p.ct. in the First Schedule of the Act, was made the subject of two appeal cases before the Valuation Appeal Court Judges. The cases were the Crieff Gas Light Company, Ltd., and the Kelty Gas Company, Ltd., whose appeals had been dismissed by the Local Lands Valuation Appeal Court deciding that the Manager's house, workmen's dwellings, and showroom did not form part of the undertaking within the meaning of clause 6 in the First Schedule; the particular sentence being "and exclusively used in connection with such supply." The Court dismissed the appeals, holding that the Valuation Committee were correct in not recognizing the Manager's house, workmen's dwellings, and showroom as part of the gas undertakings, so that the undertakings were not entitled to a 20 p.ct. deduction from the gross annual value.

In the course of the judgment, it was stated that the houses are used as dwelling-houses for the occupation of employees, and cannot possibly be said to be exclusively used in connection with the supply of gas. The Manager's house and workmen's houses are used for convenience in the carrying out of their respective duties, and that such occupation arises in the course of the Manager's and workmen's employment. This may also facilitate the regular supply of gas to the public. These considerations, however, have no real bearing on the definite and distinct criterion which clause 6 lays down, in which the word "exclusively" appears. The houses are all let in order to serve the purposes of ordinary dwelling-places for the employees and their families, and they are mainly used by the servants themselves when they are not engaged in the discharge of their duties in connection with the gas supply, and cannot possibly be said to be exclusively used in connection with the supply of gas.

The exhibition and sale of gas appliances and fittings in the showroom may promote the consumption of gas; but it cannot be held that the showroom is used exclusively in connection with the gas supply. The showrooms are used for the display of goods, and are in the same position as that of any shops displaying the products of a manufacturer's business which are not entitled to any deduction. One of the Judges stated that the shop is certainly used in connection with the business of supplying gas. If it is not exclusively so used, it must be either used in connection with some other business, or else it must be a separate independent business in whole or in part. No other business is carried on which the shop could be held to be in connection with. Accordingly, if it is not used exclusively in connection with the business of gas supply, it must be regarded as in part an independent business; but there was not much reality in this. He had doubt as to whether the appeal ought to succeed, but did not formally dissent.

Public Utility Undertakings in Scotland—Valuation for Assessment.

This important subject continues under review by a Special Committee representative of gas, electricity, and water authorities. Considerable evidence and data have been put together; and while definite representations will be made at a convenient later time, it can be said that the matter has been before the Scottish Office, and is at present receiving their attention and consideration.

New Gas Legislation.

The proposals put forward by the National Gas Council to the Board of Trade, and relating to the whole gas industry, are still the subject of consideration by the National Fuel and Power Committee and other associations and bodies, for their observations and representations.

As regards the legislation relating to Scotland only, it is now proposed to deal with this separately and immediately. The Electric Lighting (Scotland) Act, 1890, it is proposed, should be amended so that the rates charged for electricity by a town council electricity department shall be fixed sufficient to meet all charges—that is to say, consumers of electricity will be required to meet all costs connected with their own concern, including capital charges of interest and sinking fund. As the 1890 Act at present stands, advantageous low rates may be charged to electricity consumers, and a financial loss incurred by a corporation electricity department charged against the gas undertaking, thus placing a burden upon gas consumers, and all to the disadvantage of gas in competition with electricity. Electricity losses should obviously be met direct by users of electricity themselves, and not put upon the rates, in which case the gas undertaking, company, or corporation would pay taxes.

Methods of Charging for Gas.

A copy of the report of the Committee on Gas Charges has been forwarded to all members. A meeting of members of this District was held on April 4, 50 members attending. Mr. Fottrell was present, and explained shortly the features and advantages of the proposed new methods. After discussion, the meeting came to a unanimous resolution as follows:

> "This meeting of the Scottish District having heard Mr. Fottrell and discussed the report presented by the Committee on Gas Charges, unanimously approve in principle of the conclusions set out therein, but defer any definite expression of opinion as to the most suitable manner of giving effect to such conclusions pending consideration of the legislative proposals which the National Gas Council are in course of formulating at present."

It is not anticipated that any change in the existing method of charge will be suggested to the industry for at least a year. Any gas undertaking having the power to do so may readily, at any time, institute a new method on the lines suggested in the Committee's Report.

Scottish Education Scheme.

The Institution of Gas Engineers' Scheme of Education for the gas industry has made substantial progress in Scotland, and definite arrangements for classes and examinations have been instituted. The scheme is under the direction of the North British Association of Gas Managers. The sum of £286 5s. 10d. has been subscribed by gas undertakings in Scotland for the past year. This sum will be suitably disbursed among the colleges; and already grants have been made to the Royal Technical College, Glasgow, and the Heriot Watt College, Edinburgh.

General.

During the past year many important matters affecting the gas industry have been dealt with by the Central Executive Board in London, and are referred to in the "Monthly Reports" circulated to all members. The Secretary has received by correspondence throughout the year many inquiries for information on a variety of subjects. Members desiring information on any subject are invited to communicate with the Management Committee through the Secretary.

On behalf of the Committee,
W. E. Whyte, Chairman.
J. W. Napier, Secretary.

Management Committee.

The following appointments were made for 1928-29:

Chairman.—Mr. W. E. Whyte (Lanarkshire).

Vice-Chairman.—Mr. Samuel Milne (Aberdeen).

Members.—Messrs. George Braidwood (Coatbridge), James Campbell (Dunfermline), James Dickson (Dundee), Councillor Gregorson (Edinburgh), T. W. Harper (Ayr), L. Hislop (Cowdenbeath), John Lang (Alexandria), George Keillor (Greenock), J. W. McLusky (Glasgow), John M. Smith (Stirling), Councillor Stewart (Perth), and John Wilson (Motherwell).

Secretary.—Mr. J. W. Napier (Alloa).

Representatives of the Central Executive Board.

Messrs. George Keillor (1929), George Braidwood (1930), J. W. Napier (1931), and Laurence Hislop (1932), with Mr. W. E. Whyte, as Chairman of the District.

NATIONAL GAS COUNCIL.

South-Western District Executive Board Meeting.

The Annual Meeting was held at the offices of the Exeter Gas Light and Coke Company, on Friday, April 20—Mr. P. S. HOYTE (Plymouth) presiding.

The CHAIRMAN expressed the deep regret of the District Board at the loss they had sustained since the last Annual Meeting by the death of the late Chairman, Mr. G. Hardy Harris, and referred to the many services he had rendered during his occupation of the chair.

The minutes of the last annual meeting and of the last special meeting of the District Executive Board were read and confirmed; the annual report was adopted; and the list of elected members for the District was received.

The following officers were appointed for the ensuing year:

Chairman.—Mr. R. Bruford, J.P., C.C. (Taunton).

Vice-Chairman.—Mr. P. S. Hoyte (Plymouth).

Hon. Secretary.—Mr. E. P. Vince (Minehead).

Management Committee.—Messrs. J. Armstrong (Ilfracombe), C. Carrington Barber (Devonport), J. B. Cattle (Dartmouth), J. H. Cornish (Bridgwater), C. G. Dawson (Torquay), W. E. Dean (Exmouth), S. E. Halliwell (Bristol), S. J. Ingram (Truro), J. E. Norman (Weston-super-Mare), W. N. Westlake (Exeter), J. W. Whimster (Bath), and T. H. Woodcock (Stroud).

Mr. J. H. Ellis, retiring by rotation, was re-elected one of the four representatives on the Central Executive Board.

A vote of thanks was passed to Mr. E. H. Dart, the retiring Secretary, for the services he had rendered during his term of office.

BRITISH COMMERCIAL GAS ASSOCIATION.

District Conference at Truro.

On Thursday, May 24, a District Conference of the "B C.G.A" will be held in the Municipal Buildings, Truro, under the Presidency of Mr. S J. Ingram, who is President of the Cornish Association of Gas Managers The following is the programme

Morning Session.

In the City Council Chamber, by kind permission of his Worship the Mayor of Truro (Councillor Reginald K. Worth.)

11.0 a.m. Welcome by the Mayor of Truro.
Opening remarks by the President of the Conference.
Subject for discussion: "The Influence of Environment on Home Making."
1. The "Ideal" Home, by Dr. J. G. M. Molony, M.B., B.Ch. (Medical Officer of Health, City of Truro).
2. The "Ideal" House, by Mr. George E. Withers, F.R.I.B.A. (London).
3. "Its Equipment," by Mr. Leslie P. Ingram, M.Sc., A.I.C.
4. "What the Gas Industry has Done and is Doing to Promote 'Ideal' Homes," by Mr. F. G. Kingwell (Hon. Secretary of the Cornish Association of Gas Managers).
Discussion to be opened by Mr. P. S. Hoyte, A.M.I.Mech.E. (Plymouth).

1.0 p.m. Adjournment for luncheon at the Red Lion Hotel, at the invitation of the Cornish gas undertakings.

Afternoon Session.

In the City Hall, Truro.

3.0 p.m. Opening remarks by the Chairman, Dr. T. H. R. McKiernan, B.A., M.B., B.Ch., B.A.O., T.C.D. (Medical Officer of Health, Falmouth).
Lecture.
Subject: "Sunlight and Health" (illustrated by lantern slides), by Dr. C. W. Saleeby, F.R.S.(E.), (Chairman of the Sunlight League, and Author of "Sunlight and Health," &c.).

An exhibit of modern gas apparatus, arranged by the Cornish Association of Gas Managers, will be on view in the City Hall Annex on Thursday, Friday, and Saturday, May 24 to 26, to which visitors are invited.

NEW SHOWROOMS FOR CAMDEN TOWN AND ST. PANCRAS.

GAS LIGHT AND COKE COMPANY'S INCREASED FACILITIES FOR THEIR CONSUMERS.

The determination of the Directors of the Gas Light and Coke Company to furnish the greatest possible facilities and the most efficient service to their consumers was once more exemplified on Tuesday afternoon of last week, April 24, by the formal opening of premises which they have recently acquired and adapted to the purposes of a showroom and district office at 148-150, High Street, Camden Town, N.W. This branch will serve some 80,000 of their customers in Camden Town and the Boroughs of St. Pancras and Islington; and everything is on a scale which will enable the Company to cope successfully with the constant expansion of their business in that area.

On the ground floor there is a double-fronted showroom, an uninterrupted view of the interior of which is afforded to the passer-by—consequent upon the window arrangement which has already been so successfully adopted by the Company in the case of several of their showrooms. The portion nearest the windows is devoted to a display of gas fires and cookers of various types. The fires are fitted with all styles of surrounds, suitable for every type of house, from the dwelling of the artizan to the mansion. In another section are water heating appliances (such as circulators, geysers, and wash coppers), gas irons, and radiators. A new design of coke fire for sitting rooms is shown; and there are coke boilers for supplying hot water to radiators and to various points of the house. Oak panelling and grey paint give a most pleasing effect; and the lighting is a feature—comprising, as it does, inverted burners, candle burners, and ventilating lamps, all fitted with the most attractive silk shades. Centrally situated in the showroom are a cashier's counter and an inquiry counter. The new premises will also make it possible for the district staff to carry out work on consumers' premises more expeditiously; while the accommodation for all ranks of employees has been increased to meet the growth in their numbers and improved in accordance with the most modern ideas.

The Architect responsible for the arrangement, decoration, and furnishing of the building is Mr. Walter J. Tapper, A.R.A., President of the Royal Institute of British Architects; and the building contract was carried out by Messrs. Chinchen & Co., of Harlesden.

MAGNITUDE OF THE COMPANY'S OPERATIONS.

In an area of 265 square miles—extending from Windsor Park to Becontree, and from Richmond Park to the outskirts of Bushey—the Gas Light and Coke Company sell over 230 million therms of gas a year, containing heat energy equal to about five times that of the electricity sold in the whole of the "South Eastern Area," which is 30 times as large, and includes the whole of London. By themselves, these large numbers mean little. They may be explained by adding that 2½ million tons of coal and 20 million gallons of oil are required to make the gas, and that the mains through which it is distributed are equal in length to half the diameter of the earth; while 800 million pennies are now collected from slot meters in a year. About 23,000 householders have, in the last twelve months alone, made contracts with the Company for a supply of coke for domestic hot water boilers.

OPENING CEREMONY.

The opening ceremony was performed by his Worship the Mayor of St. Pancras (Councillor A. Squire, F.A.I.), who was accompanied by the Mayoress, and was supported by many of the Aldermen and Councillors of the St. Pancras and Islington Borough Councils, as well as by the President and leading members of the Rotary Club and local Chambers of Commerce. The visitors were welcomed by the Governor of the Company (Sir David Milne-Watson, LL.D., D.L.) and other members of the Court of Directors. With the Directors there were the Assistant General Manager (Mr. R. W. Foot), the Secretary (Mr. W. L. Galbraith), the Chief Engineer (Mr. T. Hardie), the Accountant (Mr. H. E. Ibbs), the Rental Superintendent (Mr. L. M. Simmons), the Chief Officer of Stores (Mr. W. McDowall), and the Controller of Gas Sales (Mr. F. W. Goodenough), together with Senior Officers of his Department, to which is entrusted the task of giving good service to the 1,250,000 consumers in the Company's area. The new district centre will be under the immediate charge of Mr. S. Watson.

On arrival, the Mayoress was presented with a lovely bouquet of carnations by little Miss Constance Leatherbarrow (daughter of one of the Company's gasfitters attached to the Camden Town Branch), to whom the Mayoress afterwards gave a brooch.

Sir DAVID MILNE-WATSON, in extending, on behalf of himself and his fellow Directors, a hearty welcome to the visitors, said that the Company had gladly availed themselves of the opportunity afforded by the expiry of the lease of the old premises to provide the district with something more worthy of its importance and more commensurate with the magnitude of the Company's operations. The new premises had been designed by a very distinguished Architect; and he felt sure there would be general agreement as to the excellence of the result. Of course, in the Mayor and Council the Company had very active opponents; but to whatever extent the claims of electricity might be justified, there was no doubt that gas also was able to render great services to the community. ["Hear, hear."] In these handsome new showrooms the public would be afforded ocular

demonstration of the enormous labour-saving and comfort-producing capabilities of gas. He had much pleasure in asking the Mayor formally to declare the premises open.

The Mayor of St. Pancras, acceding to the Governor's request, said he understood this was among the largest branch offices and showrooms of the Company. The flourishing condition of both gas and electricity certainly seemed to show that no harm resulted from fair competition. His wish was that the Gas Light and Coke Company might flourish, root and branch, for ever. [Applause.]

Tea was served in the Demonstration Hall; and afterwards the visitors inspected the showrooms.

WOODALL-DUCKHAM VERTICAL INSTALLATION AT THE SALTLEY GAS-WORKS.

Inauguration Ceremony.

A new continuous vertical retort installation at the Saltley Works of the Birmingham Corporation Gas Department was formerly inaugurated on Wednesday last by Alderman Gregory, an old member of the Gas Committee, in the absence, through indisposition, of the Lord Mayor (Alderman A. H. James).

The other members of the Gas Committee who attended were Councillors Hume, Homer, Muscott (Chairman of the Works Sub-Committee), Cooper, Corrin, and Whitehouse; together with Sir Arthur Duckham, of the Woodall-Duckham Company, the contractors for the plant; Mr. A. W. Smith, General Manager of the Gas Department; Mr. John Foster, Engineer-in-Chief; Mr. T. H. Hack (Engineer at the Saltley Works); Mr. G. C. Pearson (Engineer at the Windsor Street Works); Mr. E. B. Tomlinson (Engineer at Nechells); Mr. R. A. S. Browning (Engineer at the Swan Village Works); Mr. G. A. Bamber (Engineer at the Adderley Street Works); Mr. T. F. E. Rhead (Chief Chemist); Mr. J. Hewett (Distributing Engineer); Dr. C. M. Walter (Engineer, Research Laboratories); and Mr. R. L. Liney (Assistant Secretary).

The New Installation.

The party made a complete tour of inspection of the new installation. All the equipment was seen in operation, and the Committee were greatly impressed by the efficiency and compactness of the plant, which, it should be pointed out, reveals in a very striking way the remarkable progress which has been made during the past few years in the design of continuous vertical retorts. In the first place, the output of gas per square foot of ground space has been increased. The new plant, erected on the site of 26 beds of inclined retorts originally built in 1902, has a capacity of 7 million c.ft. of gas per day, compared with 2½ million c.ft. from the old inclined plant.

Cheap gas largely depends upon obtaining cheap coal. In order to avail themselves of as wide a range of coals as possible, while yet maintaining satisfactory carbonizing results, the Gas Department have installed an entirely new feature in gas-works practice in the provision of a ferro-concrete coal blending hopper with a capacity of 2000 tons. This hopper is divided into four sections, so that, when desired, different qualities of coal may be blended by mechanical means.

A third feature of this new plant is the fact that the retorts are heated by two batteries of independent step-grate producers specially designed for the burning of any coke which has a less ready market than the normal grades sold for industrial purposes.

This new plant is designed to give a maximum conservation of heat. Not only is the plant guaranteed to produce gas with a small consumption of second-grade coke in the producers, but the waste gases from the retorts are also utilized for the production of steam in three large Babcock and Wilcox waste-heat boilers capable of generating 10,000 lbs. of superheated steam per hour. Of every three pounds of coke put into the producers for heating the setting, well over one pound is recovered in the form of steam from the waste gases.

The carbonizing section of the plant consists of fifty-six 8-ton retorts 26 ft. 9 in. deep by 6 ft. 9 in. wide on the major axis, and tapering from 10 in. at the top to 18 in. at the bottom of the retorts on the minor axis. At the top of the retorts and beneath the main 48-hour storage hopper are fitted hand-fed auxiliary coal hoppers.

The coke is removed from the coke hoppers in skips placed on electrically driven chassis which are then hoisted by an electric transporter and delivered to a receiving hopper. From the latter the coke is fed into primary screens which separate the material into breeze, small coke, and large coke. The small and the large coke are then delivered by band conveyors into large storage bunkers, while the breeze passes down chutes into secondary screens which separate dust from the breeze. The latter is then carried by band conveyors either to a battery of hoppers arranged above the producers, or to a further screen which separates the bean breeze from the 1-in. breeze.

The Inauguration Ceremony.

At the request of Councillor Muscott, Alderman Gregory inaugurated the installation by charging a retort with coal by operating a control lever. Mr. Muscott pointed out that Alderman Gregory was one of the oldest members of the Gas Committee, and that before he became a member of the City Council he was an employee of the Gas Department at the Saltley Works. He paid tribute to the excellent manner in which the work had been carried out by the Company of which Sir Arthur Duckham was Chairman.

Alderman Gregory, in a brief address, mentioned the interesting fact that he commenced work as a labourer at the Saltley Gas-Works in November, 1886; this being before Queen Victoria's first jubilee. After working for some years as a labourer, he became a stoker, and the length of his employment at the Saltley Gas-Works was 24 years. The average workman, who was conservative in his outlook by nature, looked upon any change with a certain amount of suspicion. He almost invariably took the view that whatever the management did was for their own benefit and not for the benefit of the workman; and as a workman at that time he (the speaker) used to think the same. "I am now capable of looking at these matters from a more detached point of view," added Alderman Gregory, "and I have no hesitation in expressing the opinion that the conditions to-day are infinitely more satisfactory with regard to the health of the workmen and to the effect on the length of the working period of their lives." The advantages of efficient mechanical plant were obvious, but it must not be forgotten that one effect was to reduce the number of workmen required. He realized, however, that the process of evolution in gas-works practice must go on. The new installation marked a great step forward in efficiency, in economical running, and in economy of space. The modern gas plant occupied just about one-third of the space required by the much less efficient plants which were in vogue when he was an employee. He concluded by expressing his appreciation of the opportunity of performing so interesting a function at the works at which so long a period of his life had been spent.

Several members of the Committee and officials then charged retorts with coal by operating the control levers.

Sir Arthur Duckham, in moving a vote of thanks to Alderman Gregory, said that many years ago his firm put in the big installation of verticals at the Windsor Street Gas-Works. He felt that the Windsor Street installation had justified itself, because the Birmingham Gas Department had continued the same system. The inauguration of the present installation represented a further step forward, for it was the most up-to-date plant that he knew of in this country. The blending hoppers, which were a new feature, were built by his firm in accordance with the specified requirements of the Birmingham Corporation, so that, apart from carrying out those requirements, his firm could not take credit for this feature. He thought that Birmingham was leading the way in providing easy facilities for the mixing of coal before carbonization, because such arrangements would make for even working and for uniformity in the quality of the gas. Personally he was proud of the new plant, and felt sure that it would give thoroughly satisfactory results.

The resolution of thanks was passed, and the interesting proceedings then terminated.

Society of British Gas Industries.—His Grace the Duke of Sutherland will preside at the annual general meeting of the Society, which will be held at the Hotel Cecil, London, W.C., on Thursday, May 17. The general business meeting will commence at 2.30; and the President will deliver his address at 3.30. In the evening the members will dine together in the hotel.

Extraction of Tar Acids with Alkali.—In a paper presented to the Division of Gas and Fuel of the American Chemical Society, on the subject of the "Extraction of Tar Acids with Alkali from Primary Tar Distillates," Messrs. S. Caplan and P. W. Dilthey state that contrary to the published results of previous workers, it has been found that there is no optimum concentration of caustic soda solution for the complete extraction of the tar acids from low-temperature tar oils. The effect of concentration of alkali on the degree of extraction, as well as on the purity of the extracted phenols, has been investigated; and the use of successive washes with aliquot portions of dilute solutions of NaOH was studied. An attempt was made to explain previous results on the basis of oxidation of the high boiling tar acids in alkaline solution; but this was found to have no effect.

THE PREMIER INAUGURATES NEW GAS PLANT AT ETRURIA.

STOKE-ON-TRENT CENTRALIZATION SCHEME.

A busy day was spent by the Right Hon. Stanley Baldwin and Mrs. Baldwin at Stoke-on-Trent last Friday, when the Prime Minister became the seventh Honorary Freeman of the City—a dignity which was conferred upon him "in appreciation and recognition of the eminent public services rendered by him to the country and to the British Empire." This ceremony in the Council Chamber followed a civic luncheon in the Town Hall, at which Mr. and Mrs. Baldwin were the chief guests. Immediately on reaching Stoke in the morning, the visitors (accompanied by the Duke of Sutherland, who has large interests in the locality, and is this year's President of the Society of British Gas Industries), proceeded to the fulfilment of the first item on the day's programme, which was the inauguration by Mr. Baldwin of the centralization at the Etruria Gas-Works of gas manufacture for the City of Stoke-on-Trent. The federation of the six towns of Hanley, Tunstall, Burslem, Stoke, Fenton, and Longton, into a single borough, afterwards created the City of Stoke-on-Trent, necessarily involved questions of the co-ordination of the several public services by the new central authority; and among these questions, that of the gas supply called for early attention.

THE PREMIER AND MRS. BALDWIN ON EITHER SIDE OF THE MAYOR (ALDERMAN T. C. WILD, J.P.)

Alderman T. Mitchell (Chairman of the Committee) is next to Mrs. Baldwin, and Mr. A. MacKay (Chief Engineer) is on Mr. Baldwin's left.

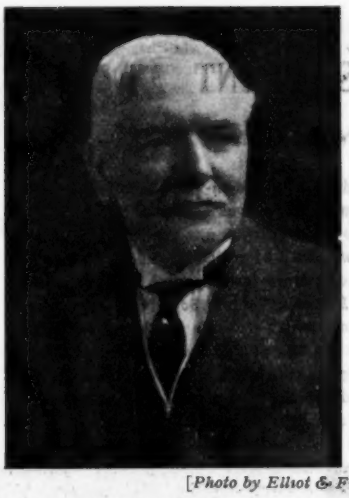
EVOLUTION OF CENTRALIZATION.

The first gas-works in the district appear to have been those erected in 1825 at Shelton, near Etruria, by the British Gas Light Company, with power to supply gas in Hanley, Stoke, Burslem, Wolstanton, and Norton-in-the-Moors. In 1852 the Company erected additional works at Brownhills to meet the increasing demand of the district. In 1843 the Stoke, Fenton, and Longton Gas Company was formed, and a gas-works were built at Stoke. In 1858 an Act of Parliament was obtained under which the Company purchased the property and interests of the British Gas Light Company in those three towns. A separate Company was formed to supply Longton. Twenty years later, the Corporation of Stoke-upon-Trent and the Local Board of Fenton combined for the purchase of the undertaking of the Stoke, Fenton, and Longton Gas Company; and the Stoke-on-Trent and Fenton Gas Act, 1878, provided for this undertaking to be governed by a Joint Committee of the two Local Authorities. This amalgamation, however, lasted only five years; for the Stoke-on-Trent and Fenton Gas Act, 1883, provided for the dissolution of the partnership. This dissolution was occasioned by the increasing needs of the district necessitating either extensions and repairs to the existing works or the building of a new works, to which, under the arrangement of joint ownership, the Fenton authorities refused to agree. Following the sanction given to this separation, the Fenton Local Board proceeded to build a new works. In 1878, also, the Longton Corporation purchased the undertaking operating in their area.

Hanley was all this time supplied by the British Gas Light Company, first from works built in 1825 at Shelton, and later from works constructed at Etruria. These works served the district for some years, until, the mining operations under the works causing subsidence of the surface of the ground endangering the safety of the works, the Company in 1900 promoted an Act to empower them to erect a new works on the present site at Etruria. These works were of sufficient capacity to supply both the Hanley and Tunstall districts. Burslem was supplied by a Company formed in 1837, under the name of the Burslem and Tunstall Gas Light Company; but Tunstall was never actually supplied by them, and in 1858 the British Gas Light Company, who since 1825 had had power to supply Burslem and Tunstall, together with other parts of the district, promoted an Act of Parliament under which the Burslem and Tunstall Company agreed to forgo their right to supply Tunstall, and the British Gas Light Company undertook to supply this town. At the same time, the British Gas Light Company agreed to cease to supply gas in Burslem. In 1877 the Local Board of Health purchased the undertaking of the Burslem and Tunstall Gas Company; and, as already mentioned, the undertakings in Fenton, Longton, and Stoke were similarly acquired in the following year.

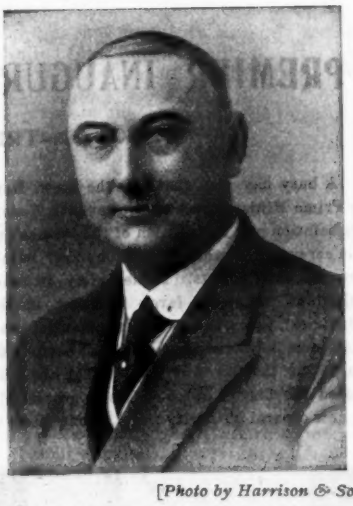
Thus when, in 1908, the six towns of Hanley, Tunstall, Burslem, Stoke, Fenton, and Longton were federated by Act of Parliament into one County Borough—the County Borough of Stoke-on-Trent—the first two of these towns, together with several small adjoining parishes, were furnished with gas by the British Gas Light Company, but Burslem, Stoke, Fenton, and Longton were supplied from four separate works, all of which passed into the possession of the County Borough. In 1925 His Majesty conferred upon the County Borough the title and status of City.

The present Chief Engineer and General Manager (Mr. Alexander MacKay, M.I.Mech.E.) was appointed in 1917, and subsequently made various reports on the condition of the four works of the Corporation. These showed that necessary improvements and extensions would call for large capital outlay; and after full consideration, it was finally decided, in September, 1919, "that the Council accept and confirm the principle of the scheme of the Gas Engineer for the establishment of a central works for the supply of gas throughout the borough, and resolve that negotiations be entered into with the British Gas Light Company with a view to ascertaining the price at which they are prepared to agree to the acquisition of their



[*Photo by Elliot & Fry.*

Alderman THOMAS MITCHELL, M.B.E., J.P.,
Chairman of the Gas Committee.



[*Photo by Harrison & Son.*

ALEXANDER MACKAY, M.I.Mech.E.
Chief Engineer and General Manager, Stoke-on-Trent Gas Department.

undertaking by the Corporation." Following this decision, the Corporation opened-up negotiations with the Directors of the British Gas Light Company, with a view to ascertaining the price they would require for the relinquishing of their Etruria Works. These negotiations were carried out without any unnecessary difficulties; the valuation of the Chairman of the British Gas Light Company and that of the Corporation Gas Engineer being sufficiently close to enable an amicable settlement to be arrived at without calling in an arbitrator.

In a handsome illustrated brochure printed for distribution at last week's inauguration ceremony, the following reference to this matter is quoted from a booklet prepared by the British Gas Light Company to commemorate their centenary in 1924:

> In view of the advantages of unification, the Borough Council approved a scheme, submitted to them by their Chief Gas Engineer, for the establishment of a central works for the supply of gas throughout the borough; and negotiations were opened-up with the Company for the purpose of ascertaining the price at which they would be prepared to part with their undertaking. Deputations from the Council interviewed the Directors in 1921 and 1922; and the scheme being obviously right in principle, and the Company's works and land at Etruria being eminently suitable for a central works such as was contemplated, the Directors, with the approval of the shareholders, eventually agreed to sell the Company's Staffordshire Potteries undertaking provided adequate terms were offered by the County Borough. These having been amicably arranged, the undertaking was, with the sanction of Parliament, transferred to the County Borough of Stoke-on-Trent on the 30th of June, 1922.

The cost of purchasing the Etruria Works was £345,000. The total capital of the whole undertaking—including the capital remaining on the old Corporation works—at the 31st of March, 1927, when most of the centralization work was nearly completed, was £757,633.

Its Fulfilment.

The centralization scheme was divided into three sections; the first, which was sanctioned in 1923, consisting of the erection of adequate plant at the central works with a view to closing-down the least remunerative of the old works—Stoke and Fenton. This portion of the scheme comprised extensions of the carbonizing plant, with the necessary auxiliary apparatus, a high-pressure main between Etruria and the Stoke and Fenton Works, and compressing plant for boosting the gas from the central works to these older works. This was completed, and gas was supplied to Stoke and Fenton, in September, 1924. The second portion of the scheme to be proceeded with comprised the chemical works.

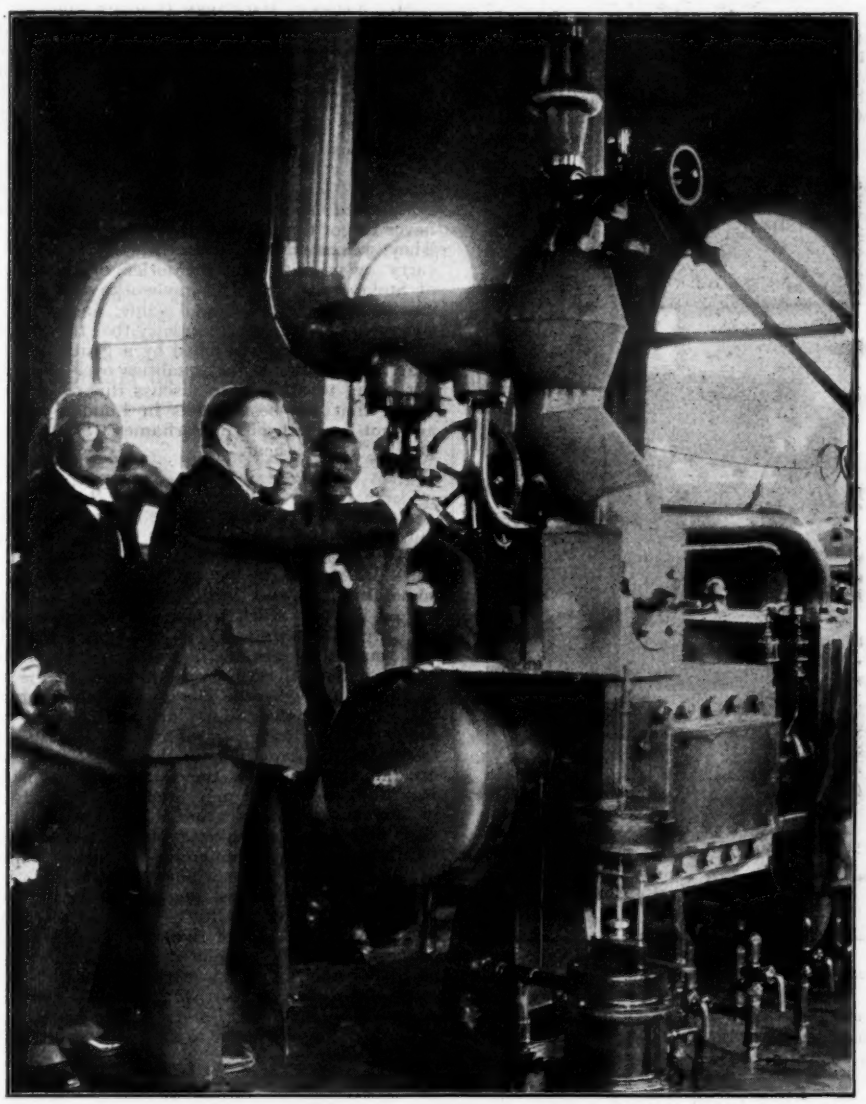
The Premier's Arrival.

On the arrival of Mr. and Mrs. Baldwin at Stoke-on-Trent Railway Station on Friday morning, Miss Alexander M. B. MacKay (who was accompanied by Miss Maisie MacKay) presented a beautiful bouquet of pink carnations to Mrs. Baldwin; and the visitors were greeted in the booking hall by the Mayor (Alderman T. C. Wild, J.P.) and Mayoress, the Deputy-Mayor (Alderman W. Walker, J.P.) and Deputy-Mayoress, the Right Hon. the Earl of Harrowby (Lord Lieutenant), Mr. A. MacLaren, M.P., Lieut.-Colonel John Ward, C.B., C.M.G.,

ON THE WAY TO THE CHEMICAL WORKS.

M.P., J.P., and the Town Clerk (Mr. E. B. Sharpley, O.B.E.). The party then proceeded in motor-cars to the Etruria Gas-Works, where the distinguished visitors were received by Alderman T. Mitchell, M.B.E., J.P. (Chairman of the Gas Committee), Councillor W. H. Good (Vice-Chairman), and Mr. A. MacKay (Chief Gas Engineer). Alderman A. Brookhouse, J.P., and Councillor C. H. Bowers, J.P. (former Chairmen of the Gas Committee), were introduced to Mr. and Mrs. Baldwin.

There were already assembled at the gas-works invited guests to the number of nearly two hundred, and among them were many members of the gas profession, some of whom had travelled long distances in order to take part in so interesting a function. The Duke of Sutherland (President of the Society of British Gas Industries) was there, as were also Sir Edwin Stockton and Lady Stockton. Mr. Henry Woodall, as Chairman of the British Gas Light Company, had a special association with the proceedings, consequent upon the original owner-



THE PREMIER STARTS THE GAS PLANT.

ship of the Etruria Works, as explained earlier in this article; and the same remark applies to Mr. John Young and Mr. Harold E. Copp, who were formerly Engineers there, and to Mr. Edward Crowther (now Deputy Engineer at Bradford), who was until recently Assistant Engineer at Stoke-on-Trent. Others associated with the works were Alderman Fred. J. West, C.B.E., J.P., and Mr. E. West (Manchester), Mr. Samuel Glover (St. Helens), Mr. B. B. Waller (Stroud), Mr. R. J. Milbourne, J.P. (Donnington), Mr. D. M. Henshaw and Mr. Percy Holmes (Huddersfield), and Mr. C. W. James (Halifax). Mr. C. S. Shapley (Engineer and General Manager of the Leeds Corporation Gas Department), Vice-President of the Institution of Gas Engineers, represented the President, Mr. H. D. Madden, in his unfortunate absence through indisposition. There were also present Mr. T. Hardie (Chief Engineer of the Gas Light and Coke Company), Mr. A. W. Smith (General Manager of the Birmingham Corporation Gas Department), Mr. W. G. S. Cranmer (President of the Midland Association of Gas Engineers and Managers), and Mr. R. H. Ginman (President of the Manchester District Institution of Gas Engineers).

A tour of the works was made in groups, under the guidance of Mr. MacKay, Mr. J. H. Rioch (Assistant Gas Engineer), Mr. J. Warrilow (Works Manager), Mr. J. R. Heath (Engineering Assistant), Mr. A. B. Shaw (Chief Chemist), Mr. John Pemberton (Distribution Superintendent, Burslem), Mr. F. Bridgwood (Works Manager, Longton), and others.

In the Vertical Retort House.

Assembling in the new Glover-West continuous vertical retort house,

Alderman MITCHELL said: We are greatly honoured in having the Right Hon. Stanley Baldwin and Mrs. Baldwin with us to-day to perform the inauguration ceremony in connection with the centralization of gas manufacture for the City of Stoke-on-Trent. As many of you are aware, this is the first real step in so far as the federation of the city is concerned, because, as an outcome of this scheme, the old works at Burslem, Longton, Stoke, and Fenton will be closed-down, and all the gas will be manufactured at the Etruria Works for supplying the whole of the consumers in the city. I will now ask our distinguished visitor to switch on the machinery in connection with the Glover-West installation of vertical retorts.

The Prime Minister smilingly complied; and he and Mrs. Baldwin were then taken by lift to the charging stage of the retort house, where Mr. Baldwin charged a retort. The extraction of coke on the floor level was afterwards witnessed.

Further Ceremonies.

Passing through the horizontal retort house, the working of which was explained, the visitors proceeded to the purifier house, where, by turning a valve, Mr. Baldwin admitted gas to

the new installation of purifiers; and afterwards in the engine room he started the compressor, which is for boosting gas to the holder stations.

Presentation to Mrs. Baldwin.

At this stage of the proceedings, the Mayor asked Mrs. Baldwin to accept a handsome tea service. In doing so,

The Mayor said: I am sure I am voicing the sentiments of the citizens of Stoke-on-Trent in extending to the Right Hon. Stanley Baldwin and Mrs. Baldwin a civic welcome to our city; and I hope they will carry away with them happy recollections of their visit here. They will share with us our pride and pleasure at the completion of the extension of our gas-works. It is, perhaps, surprising to some, but it will now be possible to supply all the city's requirements from this one works. I have much pleasure in asking Mrs. Baldwin kindly to accept this tea service, made in Longton, Stoke-on-Trent, which is so noted throughout the whole world for the production of china and earthenware.

Mrs. Baldwin, in acknowledging the gift, said: I do not think that I am by any means the only woman who enjoys a cup of tea in the afternoon, or, indeed, at any time of the day. It is the one thing we women look forward to for the soothing of our nerves, after our day's work is done. I can assure you that this beautiful set will materially assist to sooth my nerves; and it will be a most enchanting adornment to my tea table. You, Mr. Mayor, have expressed the hope that

A Tea Service for Mrs. Baldwin.

my husband and I will take away happy recollections of our visit. We shall, indeed; and, through your kindness in presenting me with this beautiful set, we shall take away something more.

Prime Minister's Good Wishes.

Mr. Baldwin followed with a brief speech, in the course of which he said: I received your invitation, Mr. Mayor, to perform this function at your gas-works with great pleasure, but without surprise. It seems to me that there is no one in the country more suited to perform in a gas-works than a politician; and if you must have a politician, why not a Prime Minister? [Laughter.] I do not mind confessing, with my customary modesty, that for turning on gas you might have got many better men; but I have done my best. To-day I have shown my faith in the great democratic institutions of our country. I have done exactly what I was told to do—pulled every lever and turned every tap, and, for all I knew, I might have been going to blow up half Stoke-on-Trent. [Laughter.] In that event, you would have seen a paragraph in to-morrow's papers headed: "Another of the Prime Minister's blunders." But you have not let me down; and I have tried not to let you down. You have started to-day an endless belt running which, I hope, will run for the benefit of the "Six Towns" until time shall end. [Applause.]

The tour was concluded at the chemical works, where there were seen the tar distillation and the sulphate of ammonia plants.

A Great Deal Expected from the Gas Industry.

Before the departure from the gas-works for the Town Hall, Mr. C. S. Shapley was presented to the Prime Minister, and addressing Mr. Baldwin said he was delighted to think that he had honoured the gas industry by visiting the Etruria Gas-Works that day.

Mr. Baldwin replied: It is an industry from which we expect a great deal in this country.

Luncheon.

Luncheon, at which the Mayor presided, was served in the Assembly Hall, and was followed by only two toasts—the Loyal Toast, which was proposed by the Mayor, and the toast of "Our Guests."

Tribute to Mr. Baldwin.

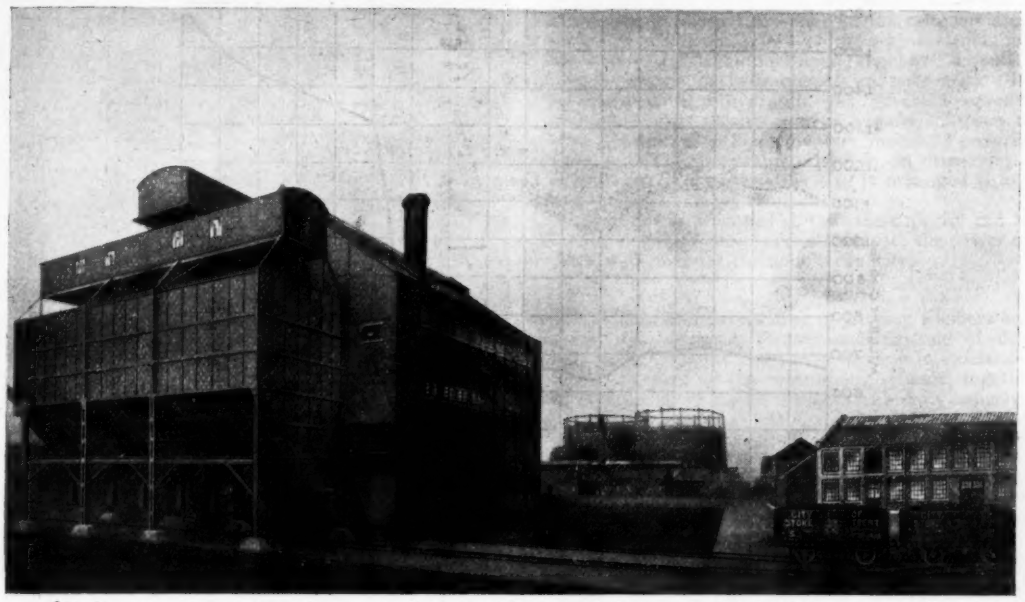
Mr. Andrew MacLaren (Labour Member for the Burslem Division of Stoke-on-Trent), submitting the second toast, said that, speaking as a member of the opposition, although there might be a gulf between his own opinions and those of the Prime Minister in the House of Commons, they were at one in recognition of the great institution to which they both belonged. The British House of Commons set an example to the nations of the earth. Though they might differ in politics, he had a very warm place in his heart for the present Prime Minister. He liked Mr. Baldwin because of many things that he noticed in the House of Commons. For one thing, he never forgot that he was a member of the House of Commons. They welcomed him most heartily, and felt sure he would carry away with him memories of the municipal enterprise of Stoke-on-Trent. The gas-works which they had seen that day possessed great capital value, and were equipped to cope successfully with any emergency that they might be called upon to meet. He was reminded by a gentleman before he entered that room that gas had qualities over electricity; but he was not going to attempt to discuss this. It was true, he understood, that the best streets in London were lighted by gas, and not by electricity. Parliament Street was illuminated by gas. ["Hear, hear."]

A Remarkable District.

Mr. Baldwin, in the course of his reply, said: I do hope I did not do Mr. MacLaren any harm in Burslem, when I said publicly that he is a friend of mine. [Applause.] I thank you, Mr. Mayor, for having given me the opportunity of seeing something, however little, of a district known to me by fame all my life but which I have never before had the honour and pleasure of visiting. You are a rather remarkable district, and you are remarkable in this way: Through all the changes of the industrial revolution, through all the changes wrought in this country by the changing methods of transport, while many parts of the country are strewn with the wrecks of old industries, you have carried on, and with as great a reputation to-day as you ever had, in that great industry for which you are famed throughout the world. Your history is a fascinating study to the layman; and it is a study of the greatness of our country in miniature. You have all the elements, both good and bad, that make up our national character. You have natural resources, commercial enterprise, manual skill, artistic design, imagination, you have sometimes that curious English quality of secretiveness, and you have not been without that peculiarly English quality of complacency. And yet throughout the years, in face of rivalry at home and abroad, one thing has persisted—the unique combination of coal and clay and craftsmanship. The making of pots is older than history. To-day your ware goes forth all over the world; and out of this centre, sometimes dirty and sometimes smoky, goes out work helping to improve and to raise the sanitary standards of the nations of the world.

Bad Policy of Secrecy in Industry.

Alluding later to the extraordinary story of the four Martin Brothers, one of whom carried the secret of his work to the grave rather than impart it to his own brothers, Mr. Baldwin said: That is a bad policy against which I have never failed to raise my voice. Such an ostrich-like policy never has helped trade; and I have always opposed it. Last week one of the biggest and most prosperous employers in the world told me that he has no secrets which he is not prepared to share with his neighbours. This spirit which we believe to be so modern—and which I believe to be essential—was the spirit which animated the founder of the Etruria Pottery Works, Josiah Wedgwood. He said: "So far from being afraid of other people getting our patterns, we should glory in it. We should throw out all the hints we can, and if possible have all the artists in Europe working after our models." I congratulate you upon the relationship which has generally subsisted in this great trade between the employers and the men. With that tradition, with your art schools, with your research organizations, and with your hereditary skill, I have no fear for the future of this district. Whatever may happen to the cheaper goods, there will always be room in the world for articles of



THE GLOVER-WEST RETORT HOUSE.

the highest and the finest quality; and when you come to that, I believe, if we all do our very best, there is no country in the world that can compare with this old country of ours. [Applause.]

THE ETRURIA GAS-WORKS.

[From a brochure prepared for the occasion.]

The final portion of the scheme involved the reconstruction of the existing horizontal retort house, increasing its capacity to about 3 million c.ft. per diem, and the erection of a new continuous vertical retort installation capable of manufacturing 3¾ million c.ft. of gas per diem, together with coal and coke handling plant, coke storage hoppers of 500 tons capacity, and a complete installation of waste-heat recovery and power-generating plant. It also involved the installation of wet and dry purification plant, and extensive enlargements and re-organization of the gas-works equipment.

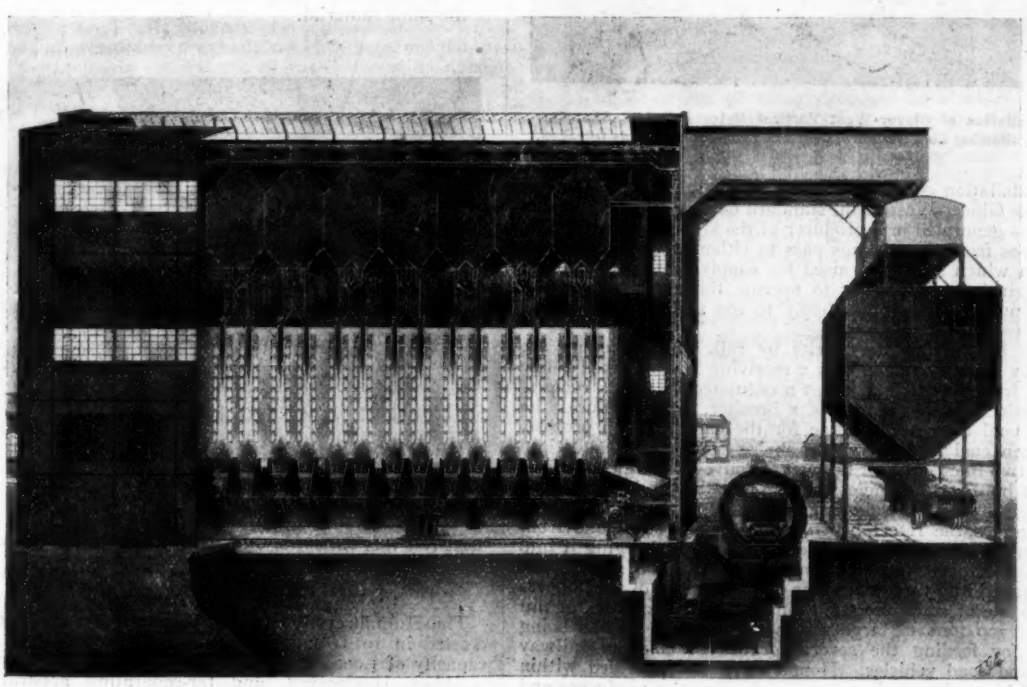
The horizontal retorts are charged and discharged by a Drakes three-tier stoking machine, which is capable of filling the 20-ft. through retorts. Each operation is controlled by a separate electric motor. There is one motor for driving the charging rotor, another for driving the discharging chain, a third for hoisting and lowering the machine platform, and a fourth for travelling the machine to and fro before the retort bench. The weight of the machine is about 22 tons.

GLOVER-WEST CONTINUOUS VERTICALS.

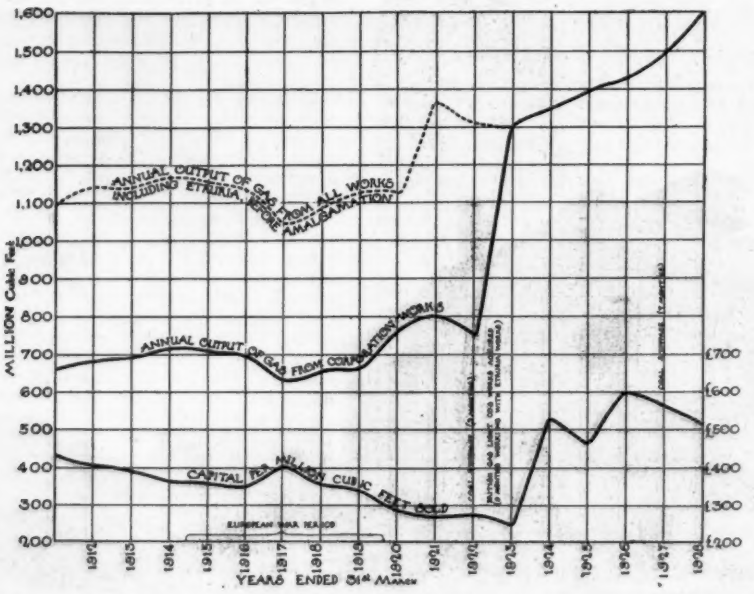
It was necessary, however, to make a further large increase in the manufacturing capacity of the Etruria Works, and all modern systems of carbonization were carefully reviewed. The continuous system of carbonization in vertical retorts presented features which were seen to be of particular advantage in the centralization scheme.

The most obvious advantage was that of the very much less ground space per million c.ft. capacity. It was possible to erect a complete installation of 3¾ million c.ft. daily capacity with provision for immediate extension to 4¾ millions, and with room for a further large extension, on the ground available for carbonizing plant at the Etruria Works.

The flexibility of the continuous vertical retort, its ready adaptability to the carbonization of various classes of coal, and the facilities for the process of steaming the charge to obtain and maintain gas of any desired quality are of particular interest in this district. The continuous vertical retort also lends itself, to a very marked degree, to the application of mechanical handling of coal and coke, as well as to the application of modern methods of waste-heat recovery. The continuous vertical retort enables the men operating the plant to do their work under more favourable conditions than in the older type of retort house, while the entire absence of smoke and steam in this

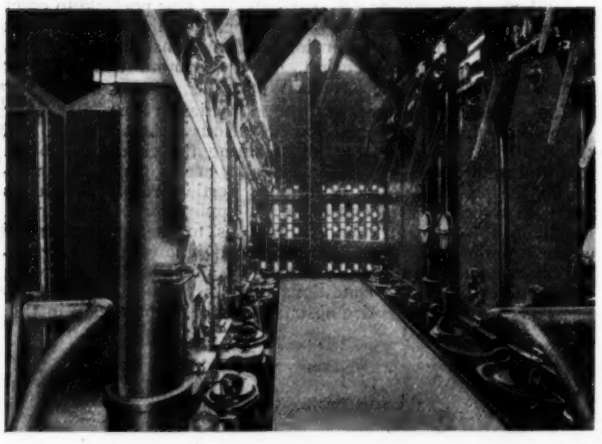


A SECTIONAL VIEW OF THE RETORT HOUSE AND COKE HOPPERS.



Growth of the Demand for Gas since the end of the First Financial Year under Federation up to March 31, 1928, together with the Capital per Million C.Ft. Sold for the same period.

system removes one of the objections to building a gas-works within the city area. In addition to these advantages, the proved low labour and maintenance costs of the system, the absence of fast-running heavy machinery, and the freedom of the gas from naphthalene were considerations which influenced the choice of continuous vertical retorts in the centralization scheme.



The Installation of Glover-West Vertical Retorts—Retort Charging Platform, showing Coal Bunkers, Coal-Feed Hoppers, and Gas Offtakes.

The installation consists of seven settings, each of eight retorts of the Glover-West 40-in. standard design, and each heated by fuel gas generated in a producer of the step-grate type. The waste gases from the settings pass to either of two waste-heat boilers, in which steam is raised for supplying the retorts and for the generation of power to operate the machinery of the installation, with a surplus supply to the auxiliary gas-works plant.

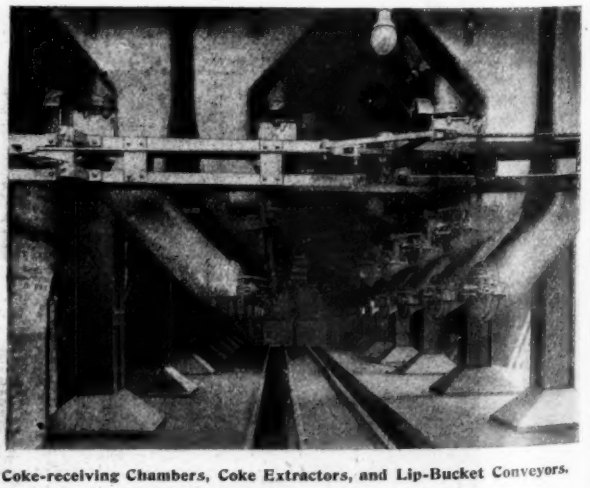
Coal is brought to the works by rail. The wagons are emptied by a rotary tippler into a receiving hopper, fixed below the rails, from which it is fed at a regulated rate by a reciprocating feeder into the mouth of a breaker, which reduces the pieces of coal to a size suitable for the carbonization process. The broken coal is delivered by chutes from the breaker into either of two lines of West lip-bucket conveyors, which encircle the retort house in an endless chain, elevating and discharging the coal into the several compartments of the coal storage bunkers above the retort bench, and receiving the coke from the bottom of the retorts, and elevating and discharging it into the storage hopper and screening plant. By the screens the coke is graded into three sizes; the compartments of the hoppers being capable of containing 100 tons of breeze, 100 tons of nut coke, and 300 tons of large screened coke, and outlets being provided for feeding the several grades of coke to railway wagons and road vehicles. Hoppers are also provided within the retort house for storing coke for feeding the producers and for filling the retorts when starting to work after scurfing.

Waste-Heat Recovery.

The waste gases from the retort settings are collected in a main flue and conducted to either of two waste-heat boilers, each capable of dealing with the whole of the gases from the seven settings, so that one acts as a stand-by to the other. Each boiler is capable of raising 11,560 lbs. of steam per hour at a pressure of 120 lbs. per sq. in., superheated 120° Fahr. The boilers were constructed under Kirke's patents by Messrs. Spencer-Bonecourt. They are of the induced-draught, fire-tube type.

For the generation of electricity two dynamos are provided, one direct coupled to a Sisson vertical compound high-speed steam engine, and one to a National vertical gas engine. Each set is capable of generating 100 KW. direct current, at a pressure of 220 volts. The generators are erected in a separate power house adjoining the retort house. The switchboard consists of two enamelled slate panels, one for each generator, and is fully equipped with switches, fuses, measuring instruments, and shunt regulators.

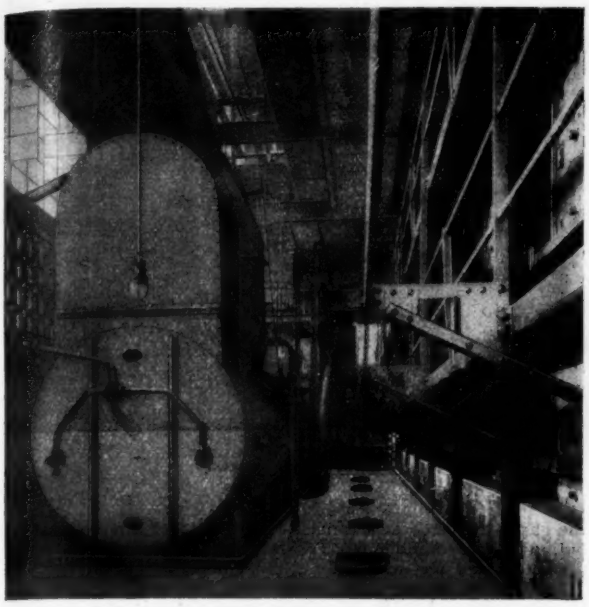
The foundations for the retort bench and retort house required special treatment in view of the concentration of so much carbonizing capacity upon so small an area of ground. The foundations were designed in the form of a ferro-concrete raft to distribute the loads over the ground at the rate of not more than 2 tons per sq. ft. The underground chamber containing the coal breaking machinery and feeding apparatus is constructed in the same material.



Coke-receiving Chambers, Coke Extractors, and Lip-Bucket Conveyors.

Carburetted Water Gas.

The Humphreys & Glasgow carburetted water gas plant was erected in 1919, and extended in 1924. It has a total daily capacity of 1,600,000 c.ft. in two sections, and is complete with washing, condensing, and tar-separating apparatus, steam-turbine blowing plant, oil feed and heating apparatus, overhead



Waste-Heat Recovery Plant.

coke storage hoppers delivering screened coke to the chargers and distributors mounted on the top of the generators, dust intercepters for removing ash and grit from the blast gases before entering the carburettors, and all other necessary fittings.

Means are provided for measuring and controlling the supplies of air, steam, and oil to the plant, with indicating instruments mounted on the operating desk, where pressure gauges for oil and steam and the operating clocks are also assembled. Electric pyrometers with indicators, also fixed on the operating desks, are provided for controlling temperatures in the oil gasifying chambers; and pressures throughout the plant are shown by batteries of direct-reading gauges. The safe and proper operation of the plant is ensured by a complete system of interlocks controlling all working valves, venting, relief, and other safety devices.

Two Lancashire boilers, working at 100 lbs. pressure per sq. in. and equipped with forced-draught furnaces for the consumption of coke breeze and low-grade fuels, are provided for the steam supply.

The carburetted water gas leaving the condensers passes into a relief holder of 360,000 c.ft. capacity, from which it is metered, and mixed with the coal-gas.

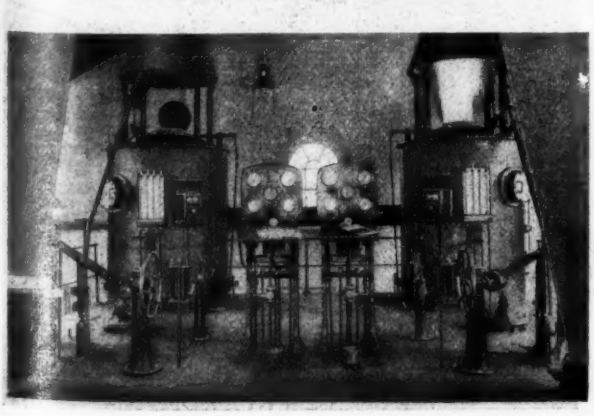
Auxiliary Plant.

To cope with the increasing carbonizing capacity of the works, the wet and dry purification plant and other apparatus has been considerably extended. The condensing plant was increased by the installation of two double sets of water-cooled tubular condensers with a total daily capacity of 8 million c.ft.

Two sets of steam-driven exhausters have been erected, each set capable of passing 175,000 c.ft. of gas per hour, or 4,200,000 c.ft. daily, from a vacuum equal to 6 in. water column and against a pressure of 36 in. when running at a speed of 70 R.P.M.

Each exhauster is direct coupled to a steam engine. The exhausters are manufactured by Messrs. Geo. Waller & Son, of Stroud, and are of their four-blade type with cylinders 46 in. in diameter by 42 in. long, equipped with disc valves 20 in. in diameter and automatic forced lubrication. The steam engines are of the single-cylinder horizontal type, fitted with Meyer expansion slide valve gear, by means of which the point at which the admission of steam to the cylinder is cut off can be varied at will from ¼ to ¾ of the piston stroke. The speed of the exhausters is automatically regulated to suit the make of gas by means of hydraulic steam governors. They are also equipped with a hydraulic gas governor operating a 10-in. diameter valve arranged on a by-pass between the inlet and outlet mains, as a supplementary means of ensuring a uniform vacuum. The gas mains are 30 in. in diameter; and an automatic by-pass valve of this size is arranged between the inlet and outlet exhauster connections.

The plant is arranged so that the capacity can be doubled by adding a second exhauster to each set; the power of the engines being sufficient for the double capacity.



Carburetted Water-Gas Plant—Operating Stage.

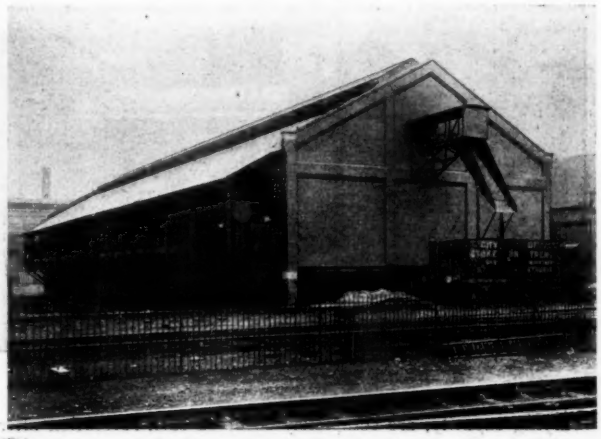
Washers.

Washing plant, consisting of Livesey washers and "P. & A." tar extractors in duplicate, each capable of dealing with 4 million c.ft. of gas daily, was already in existence prior to the commencement of the centralizing scheme, together with a set of Holmes brush rotary washers of a daily capacity of 2 million c.ft. The additional plant consists of two Holmes 1920-type brush washers with the latest design of internal construction, providing high capacity absorption at low back-pressure; the machines being capable of dealing daily with 4 million c.ft. of gas each and 8 million c.ft. when working together; the connections being arranged for either series or parallel working. The washers are steam-driven.

Purifiers.

The purifying plant, built by Messrs. C. & W. Walker, of Donnington, consists of six boxes, each 50 ft. by 30 ft., capable of purifying 8 million c.ft. of gas per day.

The boxes are of cast iron, 8 ft. deep, supported on a steel structure which is extended to carry a steel roof covered with asbestos tiles. The overhead arrangement of the boxes and their proportions were determined by the size and shape of the ground available. The nature of the ground and the very considerable weight of these deep purifiers when charged with oxide rendered special foundations necessary. Continuous cross beams of reinforced concrete were laid under the lines of stanchions, distributing the load evenly over the substrata. The installation is protected from the weather by two strongly built gable walls, each having return wings along the eaves.



Purifier House.

The purifiers are of the luteless type, each box having four covers. The gastight joint between the covers and the boxes is maintained by a continuous rubber pad secured to the covers on the Milbourne-Beard principle. The covers are handled by the usual means of worm gear blocks travelling on longitudinal joists fixed to the underside of the steel members and operated from the top of the purifiers. The boxes are fitted with four tiers of wooden grids which support layers of iron oxide, each about 21 in. thick. The gas is arranged to travel downwards through the oxide. The spent oxide is discharged through chutes to the revivifying floor below. Each box is provided with four chutes closed with self-sealing gastight lids.

The gas valves and connections are arranged so that the purifiers can be worked in two units of three boxes or one unit of six. In the former case each unit of three can have any number of boxes on or off in rotation. The purified gas from each unit passes through a hydraulic valve to the clean-gas main. When the purifiers are worked as one unit of six, any number of boxes can also be brought in or out of circuit at will. The arrangement of the valves and connections in a longitudinal annex to the building is an interesting feature of the installation. It reduces the span of the main roof and it provides a convenient means of housing the valves without encumbering the revivifying floor, giving adequate shelter to the men operating the valves. The spindles of the valves pro-

ject through the floor, and all are provided with indicators so that the flow of the gas can readily be seen. The valves are of the Milbourne outside vertical type, working the purifiers with the usual changes both in forward and in backward rotation.

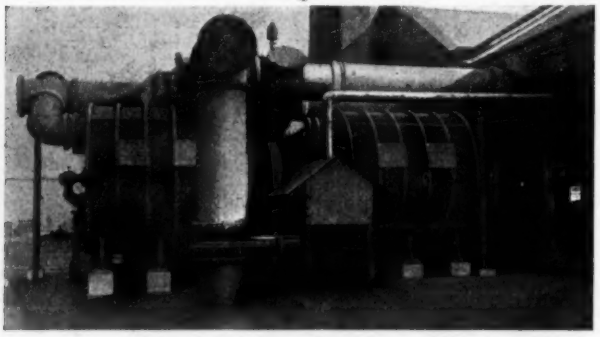
The oxide-handling plant is capable of dealing with from 40 to 50 tons per hour, and consists of a totally enclosed bucket elevator fixed in the centre of the house, delivering through a two-way swivelling chute on to a shuttle band conveyor. The fresh oxide is tipped into a concrete hopper at ground level, from which it is fed to the boot of the elevator through an adjustable slide door.

The shuttle band conveyor is mounted on a frame supported on wheels throughout its length, the wheels running on rollers fixed to the roof principals and extending for the full length of the house. It can be moved to any position on the rails to deliver the oxide at any point in a total length equal to double its own centres. It is reversible and can discharge at either end. The oxide is delivered to the purifier boxes below through a two-way travelling chute. Extending outside one end of the building is a steel cantilever structure supporting a chute for delivering spent oxide direct to railway wagons. The whole plant is electrically driven and lighted.

Meters.

To provide for the greatly increased capacity of the new works, additional station meters have been installed. These are of the Connersville positive displacement type, built by Messrs. W. C. Holmes & Co., of Huddersfield. Each meter has a normal capacity of from 3½ to 4 million c.ft. of gas per diem, and is capable of an overload of 100 p.ct. without loss of accuracy.

The construction of the meter is similar to that of the well-known exhausters and compressors of the Connersville design. The two rotors contained within the cast-iron casing are caused to revolve by the pressure of the gas, and the cavities constituting the measuring chambers, which are of known and un-



Holmes Rotary Washer-Scrubbers.

varying capacity, are completely occupied each revolution alternately by the gas and by the solid metal of the rotors. The rotor shafts are carried in roller bearings housed externally to the casing and are easily accessible for inspection without dismantling the meter.

The differential pressure thrown by the meters is nominal (less than ¾ in. at maximum capacity), and the accuracy of registration is guaranteed by the makers to be within 1 p.ct. of the theoretical figure.

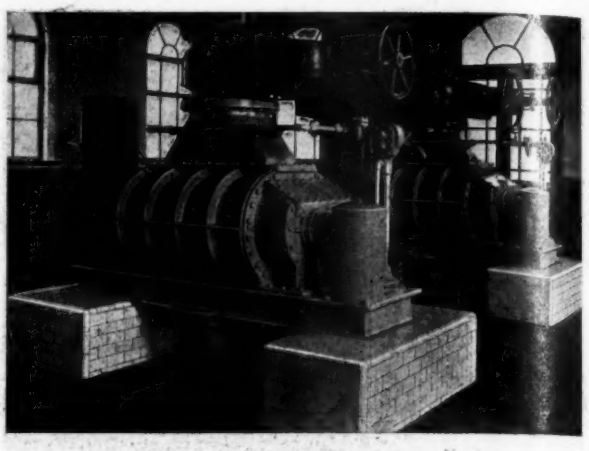
One of the outstanding advantages of this type of meter is the extremely small floor space required. In this case it is only 4 ft. by 8 ft., and the total height is only 6 ft. Recording instruments are provided as part of the meter equipment, showing, on one chart, the variations of temperature, pressure, and gas make throughout the 24 hours.

High-Pressure Distribution.

From the Central Works gas is distributed under pressure to the Stoke, Fenton, and Longton Works. The high-pressure mains are of steel throughout. A 14-in. main, 3420 yards long, connects the Central Works at Etruria with the Stoke and Fenton Works. This main is continued, 12 in. in diameter, between Fenton and Longton Works for a distance of 3750 yards, and a 12-in. diameter main, 5620 yards long, connects Etruria with the Burslem Works.

The boosting machinery consists of four rotary compressors arranged in two pairs, each pair being directly coupled to a steam engine, the complete plant thus consisting of two sets of compressing machinery in duplicate. Each set is capable of delivering 300,000 c.ft. per hour, or 7,200,000 c.ft. of gas per diem, at a pressure of 5 lbs. per sq. in., when running at a speed of 100 R.P.M.

The compressors are of Waller four-blade design, water-jacketed, with cylinders 40 in. in diameter by 42 in. long. They are direct coupled to the steam engines in a manner similar to that used for the exhausting machinery. The speed of the engines is regulated by means of steam governors of the diaphragm type, connected to the high-pressure main, so that



Connersville Meters.

the gas is delivered at a constant pressure over a wide range of output. The compressors are fitted with disc valves, 12 in. in diameter; and the inlet and outlet connections for the two sets are connected to an 18-in. main provided with an automatic by-pass valve. A 10-in. automatic relief valve is also provided.

The regulation of the pressure of the gas at the points where it is taken off the high-pressure main is effected by deadweight district reducing governors. These are 12 in. in diameter and are fitted with balanced valves operated by a flexible diaphragm actuated by the pressure of the gas in the low-pressure main. These governors are fixed in duplicate at the several points of distribution, and are so arranged that either governor can be isolated and opened out for examination without interfering with the supply of gas. They are capable of reducing the pressure from 5 lbs. per sq. in. to 3 in. water column on the outlet.

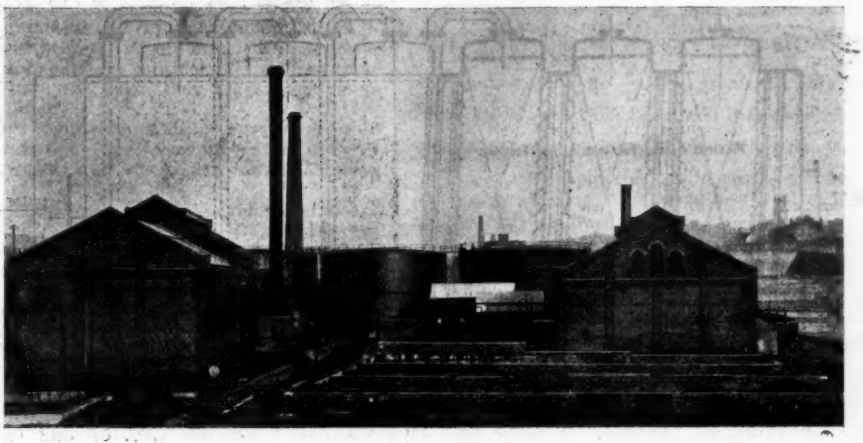
Chemical Works.

Though it was originally intended to leave the erection of a chemical works until the actual gas-making plant had been completed, the Unemployment Grants Committee were desirous that the Corporation should institute some work for the relief of unemployment in the district. The Corporation therefore decided to proceed with the erection of the chemical works under this scheme. On Aug. 18, 1924, the Ministry of Health sanctioned the borrowing of the necessary money to carry out the tar distillation and sulphate of ammonia plants and houses, tar and liquor storage, coal storage, and the steel high-pressure mains between Etruria and Longton, and Etruria and Burslem. The sulphate of ammonia plant was put into action in September, 1926, and the tar distillation plant in December, 1926, completing the second section of the centralization scheme.

The tar plant consists of a Holmes patent continuous distillation plant, in which are combined both steam and direct-fired stills of the Wikner & Hird type respectively. The plant is so designed that either dehydrated tar (to either of the Road Board specifications) or pitch (to any degree of hardness) may be produced as required. The Hird stills are heated by means of a coke breeze furnace; the waste gas from the first two stills being utilized in the final pitching still. The capacity of this plant is 50 tons of crude tar per diem. Ample storage accommodation is provided for the crude products, and the lay-out of the works is such that further refining plant for oils and tar acids may be installed. This extension is under consideration.

The ammonia plant consists of a Holmes improved-type con-

Power House.



CHEMICAL WORKS.

Laboratory.

tinuous plant for the production of neutral dry sulphate of the highest quality. The buildings for this plant have been designed to accommodate two units, only one of which has so far been installed, each having a capacity equal to the production of 6 tons of sulphate of ammonia per diem.

WORKS BUILDINGS.

In addition to the plant described, it was necessary to erect several subsidiary plants and buildings. Among the former may be mentioned a pan-ash washer for recovering unburnt fuel from the ashpans of the producers. This machine is of Waller's "Retriever" pattern, and is capable of dealing with 3 tons of pan-ash per hour.

The buildings include extensive and well-equipped workshops and a laboratory for scientific analysis and control; governor houses at Stoke and Fenton; central administrative offices and drawing office; motor garage and locomotive shed; coal store; compressor house; and extensions to the meter house.

GAS SCRUBBING.

With Particular Reference to the New "Stator" Washer-Scrubber.

[CONTRIBUTED.*]

The great advances that have recently been made in the technique of gas-making have not been equally apparent throughout the whole range of the processes involved. Carbonization, for example, has been revolutionized within the last generation. Even storage, where little could have been expected, has taken part in the general advance by the advent of the dry gasholder. Some of the intermediary processes, however, have not appeared to be susceptible to successful radical alteration. Among these processes may be considered condensation and wet and dry purification.

A vast amount of research is being conducted upon the problems connected with purification, particularly to achieve "direct" purification. This is primarily a chemical problem, but apart from this, the "mechanism" of wet purification has been recently subjected to a very careful study; and based on the results obtained, the "Stator" washer-scrubber has been evolved.

The characteristic feature of all apparatus for scrubbing is the placing into intimate contact the vapour to be removed from the gas with a suitable liquid absorbent, in a suitable manner, for a suitable time. The apparatus which is capable of performing these operations most efficiently and at the least expense is obviously the most effective. The factors which affect the efficiency of a scrubbing apparatus (by which we mean the ratio of the relative amounts of substance actually removed to that to be removed), other conditions being equal, are understood to be the following:

(*a*) The velocity of the gas in the scrubber.
(*b*) The time the gas is in contact with the absorbent.
(*c*) The type of surfaces in contact.
(*d*) The degree of disintegration of the fluids in contact.
(*e*) The manner of renewal of the contact surfaces.
(*f*) The consistency with which the apparatus maintains a uniform efficiency at any cross-section throughout its length.

The following practical desiderata should also be taken into account:

(*a*) Loss of head due to inserting the scrubber in the gas path.
(*b*) Absorption of liquid by the gas.
(*c*) Space requirements of the plant.
(*d*) Power consumed by the apparatus.
(*e*) Other working costs.
(*f*) Capital outlay.

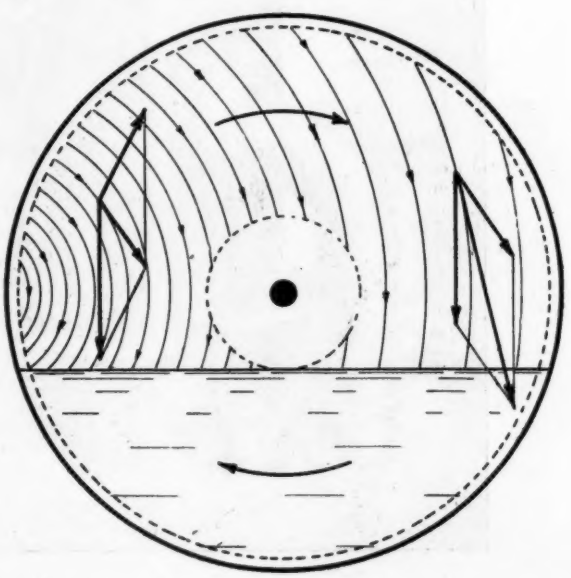


Fig. 1.

* By Major RICHARD MILES, of Messrs. Newton, Chambers, & Co., Ltd., Thorncliffe Ironworks, near Sheffield.

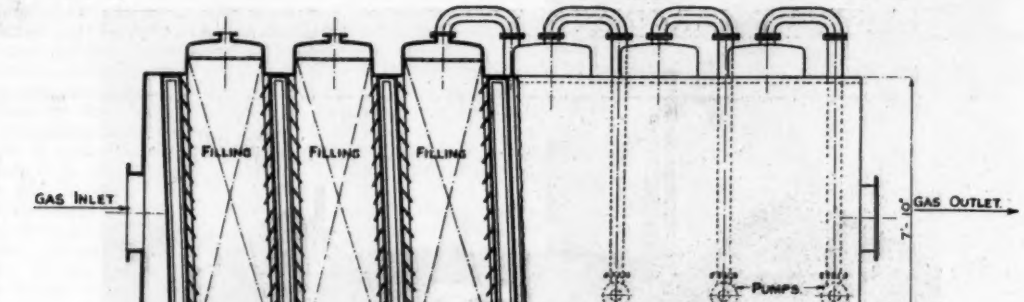


FIG. 2.—ELEVATION OF "STATOR" WASHER FOR AMMONIA FOR 3 MILLION C.FT. OF GAS PER DAY.

Washers may be divided into categories, as follows:

1. Bubbler washers.
2. Atomizing washers.
3. Wet-filling washers.

1. Bubbler Washers.

This class includes those washers where the effective portion of the apparatus is filled with liquid; the gas traversing each portion of the liquid only once, in the form of small bubbles.

It covers the many types of perforated and dished plate washers which give good results in many cases, and satisfy some of the requirements arising from the factors enumerated. Their initial cost is high and their space requirements are somewhat large, but their most serious objection lies in their back-pressure, which, being a function of the number of plates, cannot be reduced except at the expense of the efficiency of the apparatus. Their utility in gas-works practice has therefore been much restricted. (The Livesey washer is an exception to the above somewhat adverse criticism of this type of washer, but the utility of the Livesey washer to-day is chiefly due to its utilization of the "wire drawing" phenomenon whereby tar is eliminated.)

2. Atomizing Washers.

This class includes towers with a free drop of the atomized absorbent, and vertical rotary scrubbers. In theory, these are admirable, but practically they do not seem to have fulfilled their designers' claims.

To obtain satisfactory results, the atomization of the liquid should be of a uniformly very fine order, so that a given volume of liquid should present the largest possible surface, and that the liquid should remain in contact with the gas the longest possible time. The drops, however, should not be so fine as to be carried away by the gas. This entails a certain minimum diameter of drop; and the larger the drop, the less the contact surface in proportion. Furthermore, no atomizing contrivance is able to create drops of uniform size. Hence some portions of the washing medium must always be more effective than others. In other words, the apparatus cannot satisfy the requirements enumerated above, in that it cannot be uniformly efficient at any cross-section.

3. Wet-Filling Washers.

These comprise:

(*a*) Tower scrubbers with filling.
(*b*) Horizontal rotary washers.
(*c*) The new "Stator" washer.

(*a*) *Tower Scrubbers with Filling.*—Whatever filling is adopted, a practical difficulty is always experienced in wetting it uniformly. Paths of minor resistance form for both the liquid and the gas. If a calculation be made, it will be found that in most cases tower scrubbers are designed of a size very much greater than the theoretical requirements, in order to allow for inefficiency so caused. Any liquid in contact with the walls loses a proportion of its effective surface, and this is

FIG. 3.—GENERAL VIEW OF THE "STATOR" WASHER.

enhanced with an increase in height of the tower. The liquid is often re-circulated, absorbing energy in pumping, which is again enhanced by greater height. Where more than one tower is used, the space requirements are considerable; and as these towers are usually built in the open, they are susceptible to changes in weather conditions.

Where, however, space requirements are of a secondary consideration, and capital cost is not an important feature, by very careful design and operation high efficiencies can be obtained in tower scrubbers.

(*b*) *Horizontal Rotary Washers.*—A typical example of one of the most effective forms of washer hitherto in use may be considered to be the horizontal rotary washer with brushwork or other filling, and multiple compartments. The "multiple compartment" theory follows logically from the use of more than one tower scrubber in series.

The rotating filling, however, which at first glance would appear to achieve the theoretical requirements, is open to the following objections: From fig. 1, which shows diagrammatically a cross-section of such a washer, it is seen that the filling, moving in the direction of the arrow, is immersed in the trough of the liquid, and emerges moistened with the liquid due to the surface tension. The gas path is axial; and the liquid in the troughs flows usually gravitationally from one compartment to the next.

The greater part of the liquid, the velocity of which is determined by compounding its velocity of trickling along the filling with the rotational speed of the filling, will fall over an area corresponding to the left-hand side of the diagram. Hence the results are as follows:

(*a*) The left-hand side of the diagram represents a more effective area than the right-hand side.

(*b*) There is a differentiation in saturation of the gas on the two sides.

(*c*) More gas passes through the area represented by the right-hand side.

(*d*) The renewal of the liquid is greater on the left-hand side.

A number of auxiliaries have been tried from time to time to overcome this unequal action; and simplicity of operation has suffered accordingly.

As regards the duration of contact, the length of time the gas is in the apparatus is proportional to the cross-sectional dimension of the path of travel of the gas—in this case the internal cross-sectional area of the apparatus. Each portion of liquid could remain for a longer time in contact with the gas by decreasing the revolutions of the filling, but this unfortunately would decrease the amount of liquid brought into effective contact. On the other hand, an increase in rotational speed increases the back-pressure and absorbs a disproportionately larger amount of power.

Horizontal rotary washers also lack means of ensuring that the whole of the liquid employed is used before passing to the next compartment.

For example, if D = the quantity of liquid passing from one compartment to the next.
and d = the quantity of liquid dripping from the filling into the trough in any compartment,
it is seen that a fraction $D \times \frac{D}{D+d}$
of the liquor passes directly from one compartment to the next without contributing to the wetting of the filling. That is to say, there is always a portion of the liquid not utilized, as the above fraction can never be equal to zero until D = zero—*i.e.*, until no liquid passes at all—and the greater the ratio $\frac{D}{D+d}$ or the smaller the ratio $\frac{d}{D}$, the greater is this by-passing effect. From the above, it has been seen that the elasticity of operation whereby $\frac{d}{D}$ may be increased is restricted.

Further, the rapid changes in cross-sectional area and eddying due to whirling, conduce to loss of head without increasing the efficiency of the apparatus.

(*c*) *The New "Stator" Washer.*—This consists of a cast-iron or mild-steel box through which the gas passes longitudinally. It is divided into a series of compartments at right-angles to the path of the gas. These compartments are filled with a special impervious filling giving the maximum surface for the smallest volume, and disposed so as to give the least back-pressure.

At the base of each compartment is a trough for collecting the washing liquid. Between each such trough is an intercalary trough to which is attached the suction end of a small pump. The delivery end is led to distribute the liquor evenly over the following compartment. The ingenious and novel feature lies in maintaining the level of the liquid in the intercalary trough lower than that in the main troughs in both the adjoining compartments. From this it follows that, as no liquid can leave this trough except by the pumps, by-passing of the liquid is entirely eliminated. Portions of the liquid are also always flowing backwards, to be used over again in the same compartments. Both these factors add greatly to the efficiency of the apparatus.

Other features are the louvre design of compartment walls overlapping the filling, effectively eliminating "slipping" on the part of the liquid down the walls; and a general inclination of the compartments in a direction parallel to the direction of mean flow of the liquid. This direction is obtained by compounding the velocities of the vertical flow of liquid due to gravity and of the gas in a mean horizontal direction through the washer. A uniform action at any orthogonal cross-section is thereby ensured.

Fig. 2 shows a longitudinal cross-section of the apparatus, and fig. 3 a general view.

It is thus seen that the new "Stator" washer-scrubber is an extremely compact series of tower scrubbers, where the inherent objections have been scientifically eliminated. Other advantages from the considerations laid down at the beginning of this article may be enumerated:

The Capital Cost is lower than tower scrubbers and rotary washers of equal capacity, as the apparatus is smaller and less complicated respectively.

The Working Costs are lower. These are incurred only on account of the power to drive the pumps, which, due to the comparative lowness of the apparatus, is very small. There is, for example, at work a "Stator" washer for extracting benzole from town gas using only 3 H.P. for 10 million c.ft. of gas per day.

The Space Requirements are very small. Accommodation can usually be found in existing premises. Weather conditions involving changes of temperature are therefore much less liable to affect the efficiency of plant.

The "Stator" washer can be said to make by the application of the results of a logical examination of the factors concerned a distinct step forward in the practice of gas scrubbing.

INSTITUTION OF ENGINEERS-IN-CHARGE.

Annual Dinner.

Many distinguished engineers and scientists were present at the Twenty-Eighth Annual Dinner of the Institution of Engineers-in-Charge, which took place at the Holborn Restaurant on Friday last, under the chairmanship of Mr. L. St. Lawrence Pendred, M.I.Mech.E., M.I. & S.Inst., the President.

The toast of "The Institution" was in the hands of Mr. R. W. Allen, C.B.E., the President of the Institution of Mechanical Engineers, who pointed to the desirability of closer association between the senior professional bodies and their younger brethren. As an engineer himself, he had acquired a wholesome respect for the capabilities of those concerned with the actual running of engineering plants. In the past, he suggested, engineers-in-charge had not always evinced respect for the designers and manufacturers of plant; and lack of co-operation had resulted in the slowing-down of the wheels of progress. Mr. Allen then enumerated the three qualities of a successful engineer—theoretical knowledge, practical experience, and personality. He laid great stress on personality, and suggested that the social activities of the Institution, which were so admirably organized, assisted in the development of personality. He coupled the toast with the name of their President, who had, he observed, the three qualities of which he had spoken.

In his reply, Mr. Pendred, having characterized the Institution of Engineers-in-Charge as one of the most energetic and enterprising of the Junior Institutions, spoke of the excellent work of the Secretary, Captain Alfred E. Penn, upon whom so much of the success of both the business and the social sides of the Institution's activities depended.

"Industrial Research" was proposed by Mr. H. G. Burford, M.I.Mech.E., Vice-President of the Institution. He observed that the value of scientific research could be gained only by its proper application. The work of the Department of Scientific and Industrial Research lay in guiding practical men along the correct lines of development.

In an interesting reply, Sir Frank Heath put forward the view that, for industrial research, there was no need for an army of scientific men of the first rank—men who worked best when least trammelled. On the other hand, there ought to be a very large body of young, well-trained men under competent leadership. The success of industrial research in Germany was due to appreciation of the value of organization on these lines.

The toast of "Our Guests and Friends" was submitted by Mr. S. Carter (Vice-Chairman of the Institution), and responded to by Dr. W. R. Ormandy; and that of "Our President" was proposed by Mr. Henry King (Chairman of the Institution).

SOCIETY OF CHEMICAL INDUSTRY.

Birmingham and Midland Section.

A Joint Meeting of the Birmingham and Midland Section of the Society of Chemical Industry and the Chemical Engineering Group was held at the Engineers' Club, Waterloo Street, Birmingham, on April 20.

A company of about fifty, including a number of distinguished technologists, paid a visit of inspection to the heat-treatment shops at the Windsor Street Gas-Works, and the physical and mechanical testing laboratories, chemical department, and furnace rooms of the Industrial Research Laboratories of the Birmingham Gas Department.

The party were greatly interested in the various types of plant used in the heat-treatment shops in connection with the hardening and tempering of steel and its general treatment, and in the most modern types of gas-heated furnace.

A new type of gas sealed furnace (muffle type) employed for the hardening of fine tools and for moulding dies claimed special attention. This furnace is a modification of a gas sealed furnace which was introduced some years ago by Dr. C. M. Walter (Engineer in Charge of the Research Laboratories). The work required to be done was formerly suspended in a vertical tubular muffle; and the modified form consists of a gas sealed horizontal muffle. The work is introduced on a tray through the front of the muffle; and on being raised to the required temperature, the charging tray is pulled forward, and by a rotational action the work is discharged through the gas sealed tube into a quenching tank containing either oil or water. This arrangement offers many improvements over the original model.

Various types of temperature measuring and controlling apparatus, including a recording potentiometer employed for temperature recording in connection with the heat-treatment furnaces, were shown.

At the Research Laboratories at the Council House, tests on various materials were carried out, and demonstrations given of different types of mechanical and physical testing machines. In the metallographical section experiments were made by members of the party with the projecting microscopes and apparatus used in connection with photographic reproduction of metallic structures. Other sections visited included a small electrical testing laboratory where methods for obtaining critical points and cooling curves of metals were demonstrated. Types of standardizing apparatus were shown; in particular, a method for detemining the relative thermal insulating properties of materials.

At the chemical and metallurgical laboratories demonstrations were given of various apparatus for the testing of quenching oils and also the chemical composition of steels. The methods of determining the carbon contents of steels by new forms of apparatus were shown; and a high-temperature combustion furnace for the rapid combustion of steel in oxygen proved of special interest.

The party dined at the Engineers' Club; Mr. W. A. S. Calder (Chairman of the Birmingham and Midland Section) presiding. On the motion of Mr. H. W. Rowell, thanks were accorded to the Birmingham Gas Committee, the General Manager of the Gas Department (Mr. A. W. Smith), and Dr. Walter and his staff for the facilities afforded the visitors.

HEAT TREATMENT OF FERROUS METALS.

By Dr. C. M. Walter, Engineer in Charge of the Industrial Research Laboratories of the Birmingham Gas Department.

[Abstract.]

Dr. Walter dealt with the application of heat to steels of different kinds in their final state, and more particularly in regard to the manner in which heat treatment affects the mechanical and physical properties of the material. Regarding the thermal critical points of steels, he pointed out that, if a piece of steel is heated up slowly in a furnace, the temperature of the steel goes on increasing gradually until at a certain point its temperature will actually lag behind the temperature of the furnace. On continuing the heating operation, the temperature of the steel will again keep in phase with the temperature of the furnace. This phenomenon of the steel heating up less rapidly at a certain point is due to an absorption of heat to bring about a structural change in the material. The temperature at which this heat absorption takes place corresponds to the temperature at which the ferrite and pearlite constituents are converted into austenite. If the process is reversed, and the steel is allowed to cool from the higher temperature slowly, at a certain point on the cooling curve the steel momentarily becomes hotter than the surroundings, this being due to the conversion back again from austenite to ferrite and pearlite. The recalescent point is lower for a steel of given carbon content than the decalescent point; this lag being due to hysteresis, which is usually found to exist when a physical transformation takes place. The rates of heating and cooling influence the distance these two points are apart. In the case of hypo-eutechtoid steels, it will be found that more than one of these critical points exist; but with a eutechtoid steel containing about 0·89 p.ct. of carbon, all the critical points are merged into one, which is called the "A.C." point. The actual temperature at which recalescence takes place in the case of a eutechtoid steel is about 690° C.

In considering the heat treatment of steels, the temperatures at which these changes take place for any given class of steel are of the utmost importance. The carbon content of the steel is the main deciding factor in the location of the critical points, and as the carbon content increases, so the decalescent point is lower. Addition of other elements such as nickel, chromium, manganese, cobalt, and molybdenum affects the point at which transformation takes place.

Owing to the very low carbon content, wrought iron is not materially affected by heat treatment, except in so far as the dimensions of the iron grains are affected in the same manner as steel. Where an extremely hard outer case is required, case hardening must be adopted. Cast iron containing only combined carbon is generally known as white iron, and is principally used in connection with the manufacture of malleable castings; the malleablizing operation producing a graphitization of the cementite present. Cast iron containing principally iron in a graphic form is generally referred to as grey iron. Grey iron castings are often subjected to annealing at a temperature of approximately 900° C.; this treatment destroying the brittleness of castings, especially when having been rapidly cooled in the operation of cooling in the moulds.

Annealing consists of the re-heating of the material followed by cooling at a moderately slow rate; and its object may be either to remove internal stresses in the material, usually produced by mechanical work performed on the material, or to bring about a refinement of the structures, which may have been coarsened by overworking or by overheating. Where material is annealed to remove internal stress, and in order to produce softness and greater ductility, it is not always essential that the material shall be heated above the upper critical point; but where such a process is carried out to produce refinement in the grain structure, it is essential that the temperature to which the material is heated shall exceed that of the upper critical point of the material. Regarding hardening, the medium used in the case of high-speed and air-hardening steels may be still air or air under pressure, which brings about a sufficiently rapid cooling effect to retain the carbides and hardensites in solution. The process of tempering may be performed by heating in a suitable furnace, open, or by heating in oil or salts to the desired tempering temperature, after which the steel may be allowed to cool slowly or in some cases may be quenched out. Perhaps the most important preliminary treatment of steels used in the manufacture of aircraft and automobile components is the operation of normalizing. This operation consists of raising the temperature of the steel to that slightly in excess of the upper critical range, after which the steel is allowed to cool freely in air at a moderately slow rate. Such treatment results in the removal of stresses in the material and at the same time brings about a refinement in the grained structure, and this produces a more uniform product and one which is more readily machinable. In the case of mild steels, the carburizing process is carried out by heating the work in sealed pots containing suitable carburizing material at temperatures ranging from 900° C. to 950° C. The operation over, the work is generally allowed to cool slowly in the boxes, after which operation the components so treated will have a composite structure; the outer layers having a carbon content ranging from 0·6 p.ct. to perhaps 1·0 p.ct., while the carbon content of the core remains unchanged.

To harden the surface layers, it is necessary to raise the temperature to above the critical range of the surface material. If quenched from this temperature, the outer layers would be hardened, and the case refined; the core being unaffected.

With regard to fuels which are employed in connection with heat-treatment work, practically every kind of fuel, including solid fuel, town gas, producer gas, and oil, is employed for this purpose. For certain work, more particularly in connection with the hardening of special tools, furnaces operated electrically have been employed. In view, however, of the necessity of having complete control over the temperature during the various operations, and of carrying on the processes at a reasonable cost, it may be said that the fuel most universally adopted is town gas, where this is available at a reasonable price. The use of town gas for such purposes as carburizing, annealing, and re-heating is becoming universal in manufacturing centres in this country.

Furnaces operating on town gas are readily adaptable to mechanical methods of charging, and at the present time, in many of the factories producing motor components, large automatically-operated town gas fired furnaces are used for such processes as normalizing and re-heating of forgings and case-hardened parts. In cases where the operation of heating is of a more continuous nature, furnaces fired by town gas are usually of the recuperator type fitted with atmospheric burners,

and so arranged that the secondary air used for the combustion of the gas is pre-heated prior to meeting the primary air and gas mixture. Such furnaces have a high thermal capacity and are very efficient, and at the same time are capable of producing temperatures even up to those required in connection with the hardening of high-speed steel.

For processes such as re-heating, hardening, and tempering, where the work is of an intermittent nature, town gas furnaces of low thermal capacity are generally employed. These are designed, as a rule, on the semi-recuperator principle, but in some cases, direct heated furnaces may be employed with advantage. Town gas can also be applied very satisfactorily to the heating of salt baths, lead tempering pots, and also oil tempering baths.

In regard to case hardening, Dr. Walter referred to the advantages to be obtained in this process by the use of some of the heat-resisting materials which are now on the market, more particularly in the form of pots for containing the work which is heated in the carburizing material. Experiments on this class of material have been carried out for several years, and the results seem to show without any doubt that when used in town gas fired furnaces, some of the nickel-chrome pots now being produced commercially can be employed at a lower pot cost than the ordinary steel pot hitherto used for this purpose. Further, there seems to be little doubt that a life of over 5000 working hours at a carburizing temperature of 900° to 950° C. can be obtained with this class of pot when used in conjunction with a town gas fired furnace.

An interesting discussion followed, in which Prof. J. W. Hinchley (Hon. Secretary of the Institution of Chemical Engineers), Mr. S. J. Tungay, Mr. H. Talbot (Chairman of the Chemical Engineering Group), Dr. Sandys Wunsch (London), Mr. A. J. Broughall (Chemical Engineering Group Representative, Midland Section), Mr. W. A. Benton, Mr. H. W. Rowell, Mr. Sarjeant (Sheffield), Mr. Fallon, and others took part.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held at Pontypridd on March 10. In the afternoon a visit was paid to the Chain Works of Messrs. Brown, Lenox, & Co., Ltd., under the supervision of the Company's Manager, Mr. Morris, supported by Mr. D. Muir, Engineer and Manager of the Pontypridd Urban District Council's gas undertaking. A thorough description of the process of chain making was given, and the various shops were visited. The thanks of the members to Mr. Morris and his Company were expressed by the President of the Association, Mr. T. V. Blake.

The Municipal Buildings, Pontypridd, were placed at the disposal of the Association; and in the evening a general meeting was held there.

NEWPORT RIVER BRIDGE: LAYING OF GAS MAINS.

By H. D. HAZELL, Distribution Superintendent of the Newport (Mon.) Gas Company.

In 1922 the Newport Corporation decided to scrap the bridge over the River Usk, and to erect a new one in its place. A temporary bridge had to be built to carry the traffic while the new bridge was being erected, with approaches to the existing road at each end. During the lifetime of the old bridge a number of public departments had laid mains, conduits, cables, &c., across it, and all these services had to be transferred to the temporary bridge.

With regard to the gas mains, the Gas Company already had a 24-in. main in each approach road to the bridge, east and west of the river. These had been laid a number of years previously; and while it was impossible to link up these two mains with a 24-in. connecting main over the old bridge, owing to its limitations, there was no difficulty about making this provision on the temporary bridge. Valves had already been fixed on the ends of the two mains. Consequently, when the work of linking up was commenced, we were able to carry the complete job right through in the dry state—that is, without having to make a connection direct with a live main and carry the gas forward as the work proceeded.

We commenced work from a 24-in. valve on the western side of the river. We found that the valve to which we had connected was not perfectly gastight; and in order to keep the gas back from the workmen, we inserted bags as a precaution. On this portion of main a **Y**-piece was inserted with a valve on the branch, from which we could later cross to the other side of the road, when we had to connect up to the main on the new bridge. A second valve was inserted beyond this **Y** branch, and from this valve we continued with the main on to the temporary bridge. The function of this second valve was to shut off the gas from the temporary bridge when it was dismantled.

For lowering the pipes into the trench, we used the usual shear-legs and chain pulley blocks; but on the temporary bridge, since the road surface was already made, and our main had to be laid underneath, the pipes were dumped on the river bank at the side of the bridge, and then moved on rollers into position to the far side of the bridge, working back towards the dump along a wooden runway on which the mains were to be laid. This runway was suspended by steel hangers from the girder work supporting the road above.

The joints on the first portion of this main were made in the usual way with yarn and molten lead, but on the temporary bridge, owing to the risk of fire and the possibility of accidents in manipulating ladles of molten lead on the narrow runway, yarn and lead wool were used instead.

Proceeding to the eastern side of the bridge, we were able to cross the road to our position on the south side—of course, only opening half the road at a time. Two valves were again provided at this side, one for shutting off the gas from the temporary bridge when it would no longer be in operation, and the other ready for extending the main on to the new bridge. The whole of this work was carried out in the latter half of 1922.

In addition to the 24-in. low-pressure main, a 6-in. high-pressure main was laid to take the place of a 6-in. high-pressure one on the old bridge, which was used for boosting the gas supply at times of increased demand. This was laid in Mannesmann steel tubes from branches in the old main, and was attached to the 24-in. main on the temporary bridge by means of clips in halves, which were placed round the two mains and bolted together.

TUNNELLING.

In 1924 it was decided to demolish the old bridge and erect the new one; and the Gas Company secured a position on the south side. At the eastern end we were already on the south side, but at the western end we had to cross the road with our 24-in. main; and it had to be laid at a depth of 6 ft., to get past all obstacles; and in order to interfere with the traffic as little as possible, it was decided to tunnel under the roadway. A shaft was therefore sunk and well timbered; and when we had reached the necessary depth, our heading was commenced. Tunnelling is a slow process, as only one man can work at a time at the face; and consequently we worked night and day shifts until the necessary excavation was completed. We were fortunate in having the services of a couple of miners for this job, who got through the work expeditiously. The tunnel was 4 ft. square and was well strutted throughout. The extent of the excavation was carefully measured and checked, and the pipes were then lowered and man-handled into position. We used 6 ft. pipes for this portion of the work, for ease in handling, for, owing to the restricted space in the heading, the usual 12 ft. pipes would have been very heavy and difficult to work into position. A pipe was placed at the far end of the tunnel first of all, and then the remainder were placed behind this one, working backwards towards the beginning. Having got the pipes into the position required, we commenced the jointing at the shaft end, and worked towards the face. The jointing completed, large stones were placed on each side of the main, and well packed. A layer of earth was put on top and across the main, and concrete above to the roof of the tunnel. The timbering was left in position.

Having described how the mains from the old bridge were cut off before its demolition, the author said that the depth of ground from the road surface to the crowns of the arches on the new bridge was so restricted that, though the main was to be laid in the footpath, there was not sufficient depth to take a 24-in. main across. Two lines of 20-in. main were therefore laid instead. Starting at the western end, he continued, we excavated to find the end of the 24-in. main which had previously been laid in our tunnelling across the road. This was extended, and a breeches pipe fixed (24-in. main with 20-in. branches) with a valve on each branch. These valves were provided at both ends of the bridge so that the gas might be turned off completely from either of the 20-in. lines of main, in the event of leakage. The valves were fixed side by side in a pit. In our excavation for this pit we encountered a portion of the abutment wall of the old bridge, which we removed with the aid of pneumatic drills; also a portion of the steel work, which we cut away with an acetylene blowpipe. The excavation was 10 ft. square and 10 ft. deep, and had to be well timbered during our operations. A concrete floor was provided for this valve pit, and, later, 14-in. walls were taken up to the level of the road surface, and a reinforced concrete roof was provided. From these two 20-in. valves, two lines of pipes were taken on to the bridge itself.

"VICTAULIC" JOINTS.

So restricted was the available cover that if the usual socket and spigot pipes had been laid, the joints would have appeared above the road surface. Also, there was insufficient room to swing a hammer to set up the lead joints. Cast-iron pipes were used, but instead of employing socket and spigot joints, the "Victaulic" method of jointing was substituted. For this joint the pipes are provided with a faced bead at each end.

The method of jointing is as follows: The pipes are laid end to end with a small clearance between them (about ¾ in.). A leak-proof ring in the form of a double **U** washer is placed over one pipe end, and when the next pipe to it is in position, this ring is slipped along the pipe so that its lips fit on the beaded ends of the two pipes. The ring is made of specially treated rubber. A housing is then bolted round this ring. This is made in two segments for smaller mains, and in four or eight segments for larger mains. Those at Newport were in four segments. They are made of a steel alloy and are ductile. They fit over the leak-proof ring and the beads of the two pipes. Two great advantages of this joint are the small amount of space taken up by it, and the ease and quickness with which the jointing can be made. The average length of time taken by our men on the 20-in. joint-making was six to seven minutes each, without previous experience. The joints on the two lines of pipes were staggered so that a joint on one pipeline was 6 in. in front of a joint on the other pipeline, thus giving more space for the making of the joints than if the joints on the two pipelines had been exactly opposite. Another point about the "Victaulic" joint, which was demonstrated during the course of our work, is its flexibility. Owing to the limited space available, it was necessary that the pipes should be laid with extreme accuracy in predetermined positions as regards levels and distance from the curb line. In one portion of the work it was found, upon checking measurements, that a length of 75 yards of main required slight adjustment in levelling. Within a matter of two to three hours the alteration was made without disturbing the joints. There was no need to make special provision for the pipes to conform to the camber of the bridge, for the joints are sufficiently flexible to permit of this being done automatically.

Owing to the irregularities on the surface at the time we laid these mains, it was not possible to take lorries on to the bridge itself. All the off-loading of the pipes from the lorries had to be done at the western end of the bridge. A ramp was erected in timber from the bridge level up to the height of the floor of a lorry, and a light railway laid the whole length of the bridge and alongside our pipeline. As each lorry arrived, the pipes were pinched by levers out of the end of it on to the ramp, were run down this and on to a bogie on the light railway, and then transferred to the positions as required.

At the eastern end of the bridge a valve was fixed on each pipeline, and a pit was built to accommodate the two valves. The two 20-in. pipelines were then reduced to one 24-in. by means of a breeches pipe; and this 24-in. main was continued in socket and spigot pipes to the valve which had been fixed previously, when the main was laid over the temporary bridge.

In addition to the low-pressure main, we had also to lay a 9-in. main for high-pressure gas. This was laid in Mannesmann steel tube in concrete in the roadway. The joints adopted on this pipeline were of the rigid welded type. The spigot end of one pipe is driven into the socket of the next to a distance of 10 in., and forms a close-fitting joint. The face of the joint is made gastight by welding. The Mannesmann tubes varied in length from 20 to 35 ft., and all the joints were welded *in situ*. Half-way along the bridge the gradient of the road altered, and the tube which was laid at this point was supplied bent accordingly to the required angle. The pipelines completed, the work was tested throughout with air pressure. Blank ends were fitted on to the "Victaulic" pipelines, and caps were welded on the Mannesmann steel pipe. Tests applied were 5 lbs. and 60 lbs. per sq. in. respectively. Gauges were fitted for noting any drop in pressure due to leakage during the course of a two hours' test, and all the joints were tested by smearing with soapy water. The work was found satisfactory, and the pipelines were then connected up to the live mains.

The air in the mains was got rid of through a 2-in. blow-off pipe placed in front of the closed valve at the eastern end of the bridge. The valve at the western end was partially opened, and the inflowing gas drove out the air through the blow-off pipe. Tests were taken by filling a bag with the mixture from this pipe, and igniting it; care being taken that it was not ignited in the vicinity of the escaping mixture. After several tests, and when a satisfactory flame was produced, the blow-off pipe was removed and the valves at both ends were fully opened.

Having directed the flow of gas over the new bridge, our last operation was to stop the flow over the temporary bridge. The temporary bridge has not yet been dismantled, and the gas mains have accordingly not yet been removed. The new bridge was opened on June 22, 1927, and up to the present no leakages have been discovered on our work.

On the proposition of Mr. W. T. LANE (Cardiff), seconded by Mr. C. S. THANE (Newport), a vote of thanks was unanimously passed to Mr. Hazell.

Thanks were also accorded the Pontypridd Urban District Council and Mr. D. Muir, the Gas Engineer and Manager, for the facilities provided for holding the meeting, on the proposition of Mr. A. E. MARTIN (Merthyr Tydfil), seconded by Mr. C. B. FELTON (Newport).

GAS LIGHT CO-PARTNERS AND THE GOVERNOR.

From Mr. W. Hayes, Secretary of the Co-partnership Committee of the Gas Light and Coke Company, we have received information of an event which is, we believe, unique in the history of industrial relations in this country. At 7.30 p.m., on Saturday, May 12, some 12,000 Co-partner employees of the Company are assembling at Olympia for the presentation to their head, Sir David Milne-Watson, the Governor and Managing-Director of the Company, of his portrait by Sir William Orpen, R.A. This they have, on their own initiative, subscribed for, and are presenting to him as a token of their regard and esteem in celebration of his receiving the honour of knighthood from His Majesty the King, and in gratitude for the many evidences they have received of his care and thought for the welfare of all employed by the great undertaking. This will be a wonderful demonstration of the affection of the co-partner employees for Sir David.

Natural and Manufactured Sunlight in Modern Medicine.—In the Chadwick Public Lecture to be given at the House of the British Medical Association on Tuesday, May 15, at 8.15, Major Walter Elliot, M.P., M.B., Ch.B., D.Sc., will give a short review of some recent research work on this subject, and discuss the experience of certain local authorities. Special reference will be made to Scottish experience, as this comes under the notice of the lecturer as Under-Secretary to the Board of Health, Agriculture, and Education in Scotland.

The Pig Iron Industry.—At the annual dinner of the National Federation of Iron and Steel Manufacturers on April 19, Mr. E. J. Fox (Managing Director of the Stanton Ironworks Company, Ltd.), the President-Elect, in proposing the toast of "His Majesty's Government," drew attention to the fact that there was likely to be a reversion for many purposes to the use of wrought-iron. Already The Institution of Gas Engineers, whose members were probably the largest users of service tubes in the country, had laid down, in their recent standard specification, that the material of which their tubes were to be made was to be wrought-iron. It would therefore be a matter of regret if inability to obtain the material at home gave them an excuse for going abroad. It seemed to be a matter of paramount importance that the economic conditions prevailing in this country should give the pig iron industry a chance of re-establishing itself.

THE CARDIFF MEETING.

Hotel Accommodation.

It would appear that many members of The Institution of Gas Engineers are now finding difficulty in booking up hotel accommodation for the Annual Meeting. The position is that there is very little accommodation left in the Cardiff hotels, and that only at the commercial hotels; but there is ample first-class hotel accommodation at both Newport and Barry. Newport (11 miles from Cardiff) is on the main line, and has an excellent train service to and from Cardiff; there being no less than 46 trains each way in the 24 hours. Barry is 8 miles from Cardiff, and also has an excellent train service—38 trains each way every 24 hours. In addition, there is ample first-class boarding-house accommodation at Cardiff. The local Reception Committee (of which Mr. Octavius Thomas is Secretary) has had under consideration the desirability of themselves undertaking to secure accommodation for those members who may not already have done so. They will be pleased to arrange accommodation upon application to Mr. Octavius Thomas, addressed c/o Gas Offices, Bute Terrace, Cardiff. Doubtless this will save much time, and also be of assistance to those members who may not already have booked up.

American Gas Association.

We have received the newly issued membership list of the American Gas Association. It makes an octavo volume of no less than 248 pages, only about 15 of which are required for setting forth the Constitution and the Articles—the remainder being required for recording the membership. The composition of this magnificent representative organization of the gas industry of the United States is shown by the table of contents. In the first place, there are Gas Company Members and Accredited Delegates; (2) Holding Company Members, Accredited Delegates and Member Companies Controlled; (3) Accredited Delegates of Gas Company and Holding Company Members; (4) Manufacturer Company Members and Accredited Delegates; (5) Associate Company Members and Accredited Delegates; (6) Accredited Delegates of Manufacturer Company and Associate Company Members; (7) Individual Members. Individual members are divided into classes "*a*," "*b*," "*c*," and honorary members. To find the total of the membership would absorb considerable time in calculation, though we have no doubt the figures are available in the records of the Association itself.

MR. H. H. GRACIE'S PRESIDENTIAL ADDRESS.

North British Association of Gas Managers, April 13.

(Concluded from p. 243.)

RETURNS FROM, AND PRICES OF, TAR.

The returns from tar show just as much fluctuation as coke (Charts Nos. 11 and 12, Statement No. 8). Up to 1901 the ammoniacal liquor was disposed of with the tar; and when we look over the yield per ton of coal from these two products, we observe that it does not differ very widely during the first thirteen years—the figures reading from 1s. 7d. to 2s. 11½d. per ton of coal. Immediately the production of sulphate of ammonia was fully under way at Granton, however, the return from the two products jumped up to 3s. 11d. per ton, and fluctuated between that figure and 3s. 3½d. for about ten years. Tar during that time fell from 2s. 2d. to 1s. 2d.; sulphate of ammonia varying from about 1s. 9d. to 2s. 7d. per ton of coal. For the following eight years, tar varied from 1s. 10d. and 2s. 3d. in 1912 and 1913 down to 1s. 3d. in 1917, which was probably the period of maximum stress during the war. It should be noted that, in this and following years, toluole and benzole were being extracted for high explosives; and the additional return from these amounted to about 2s. per ton of coal, which somewhat made up for the reduced figure from tar. Thereafter the return rose gradually until in 1920 it reached 3s. 8d. per ton of coal. In the following year—that of the coal strike—the price mounted to the high figure of 6s. 8½d., which constitutes a record. Thereafter it fell to 3s. 3½d. in 1925, and in 1927, owing to the coal dispute, it had risen again to 5s. 7d.

STATEMENT No. 8.—(CHARTS NOS. 11 AND 12.)

Return from Tar and Sulphate of Ammonia per Ton of Coal Carbonized. From 1889 to 1927.

Year.	Return from— Tar and Liquor per Ton of Coal.	Return from— Toluole and Benzole per Ton of Coal.	Average Price of Tar per Ton.	Return from Sulphate of Ammonia per Ton of Coal.	Average Price of Sulphate of Ammonia per Ton.	Total Return per Ton of Coal from Tar, Liquor, and Sulphate of Ammonia.
	s. d.	s. d.	s. d.	s. d.	£ s. d.	s. d.
1889	2 5·04	..	..	..	..	2 5·04
1890	2 5·06	..	..	..	..	2 5·06
1891	2 11·67	..	..	..	..	2 11·67
1892	2 3·69	..	..	..	..	2 3·69
1893	1 7·89	..	..	..	..	1 7·89
1894	2 8·56	..	..	..	..	2 8 56
1895	2 9·63	..	..	..	..	2 9·63
1896	1 11·82	..	..	..	..	1 11·82
1897	1 9·48	..	..	..	..	1 9·48
1898	1 7·10	..	..	..	..	1 7·10
1899	2 0·85	..	..	..	..	2 0·85
1900	2 11·25	..	..	..	..	2 11·25
1901	2 2·30	..	..	..	..	2 2·30
1902	1 4·50*	..	..	1 2·12†	..	2 6·62
1903	2 2·10	..	31 2	1 8·88	11 14 8	3 10·98
1904	1 11·34	..	23 7·1	2 1·65	11 14 1	4 0·99
1905	1 5·92	..	17 0·9	2 3·61	11 17 3	3 9·53
1906	1 6·63	..	17 7·6	2 3·38	11 17 1	3 10·01
1907	1 5·22	..	17 11·6	2 3·15	11 14 1	3 8·37
1908	1 5·17	..	20 11·2	2 2·52	11 9 8	3 7·69
1909	1 4·25	..	17 9·5	1 11 82	10 17 2	3 4·07
1910	1 1·94	..	20 6·9	2 1·80	10 17 11	3 3·74
1911	1 4	..	23 8·5	2 7	12 0 6	3 11
1912	1 10	..	29 5·6	2 11	13 10 2½	4 9
1913	2 3	..	36 11·9	2 10½	13 7 0	5 1½
1914	2 2½	..	35 4·96	2 5	11 19 2	4 7½
1915	1 8	..	27 5·1	2 6	11 17 3	4 2
1916	1 6	..	24 9·31	3 1	15 7 2	4 7
1917	1 3	2 0½	22 4·2	2 9	15 10 9½	6 0½
1918	1 7	2 0	26 7·5	2 4	14 16 1	5 11
1919	2 1	1 1	36 5·5	2 10½	18 0 0	6 0
1920	3 8	..	64 9·5	3 4	19 17 2	7 0
1921	6 8½	..	125 1	2 8	23 0 7	9 4½
1922	3 1	..	56 6·3	1 7	14 0 7	4 8
1923	5 10	..	86 10½	2 4	13 10 6	8 2
1924	6 2½	..	98 1·8	1 6	11 16 5	7 8½
1925	3 3½	..	50 4·5	1 10	11 14 1	5 1½
1926	3 10½	..	58 9	0 11	9 0 4	4 9½
1927	5 7	..	100 1	0 5½	10 1 6	6 0½

* Tar only. † Sulphate of ammonia started.

BRITISH ROAD TAR ASSOCIATION.

The value of tar during the current year has been fairly high. The efforts of the British Road Tar Association to secure a suitable specification for road tar, to lay down experimental sections of roads, and to demonstrate the best methods of construction, as also to bring the merits of this material as a road builder and surfacer to the notice of road authorities, will, we hope, result in the price being stabilized at a reasonable and remunerative figure. There is every evidence that the Association is moving ahead in a business-like way, and is receiving the support of most, if not all, interested parties.

The fluctuations in average prices per ton received for tar from 1903 onwards are also shown in Chart No. 12 and Statements Nos. 8 and 9. The extremes are very great, varying from 17s. in 1905 up to 100s. 1d. in 1927. This instability is good for neither buyer nor seller; and if a settled price which would give a reasonable return to the producer and be acceptable to the purchaser could be arranged, it would be beneficial to all concerned.

SULPHATE OF AMMONIA.

The manufacture of sulphate of ammonia was started at Granton about 1902, as soon as the new plant was ready; and from that year up to 1920, the yield from this product has varied between 1s. 9d. and 3s. 4d. per ton of coal, which is the maximum price yet reached. (Charts Nos. 11 and 12, Statements Nos. 8 and 9.) From 1921 it has gone steadily down from 2s. 8d. in that year to 5½d. in 1927, due largely to severe competition from other fertilizers, and to the large production of synthetic ammonia. The outlook for this product is at the moment none too promising; and its ultimate price and value will depend, to some extent, on the success of the propaganda which has been undertaken to bring its merits as a fertilizer before other likely consumers both at home and abroad, and to extend its use for this purpose in every possible direction. The variations in price per ton are also shown in Chart No. 12 and Statement No. 8—the extremes being £9 0s. 4d. in 1926, and £23 0s. 7d. in 1921.

USE OF SULPHATE OF AMMONIA IN GRASSLAND MANAGEMENT.

A new development in the use of sulphate of ammonia for grassland management has been tried out, and is rapidly coming into favour among farmers. Briefly, it consists of periodic dressing of grassland with carefully measured quantities of sulphate of ammonia. Where large fields are available this makes an ideal arrangement, but on smaller farms the fields can be split up into plots of suitable size. The immediate result is that a much greater yield of grass is obtained, and that a larger number of cattle can be grazed on any given area, by being moved round the various plots in rotation. Another advantage is that the stock can be put out to graze earlier in the season, and can be kept on grazing well into the autumn. It is claimed for this scheme, not only that considerable financial benefit arises (the saving in many instances reaching as high as £4 per acre), but that, in addition, a higher grade, quality, and quantity of milk are obtained. A greater number of cattle can be reared, with an ultimate saving in the weight of meat, cheese, butter, milk, &c., to be imported and paid for by this country. I may add that it is intended to adopt the system in our own area, and needless to say the results will be watched with keen interest.

You will readily realize that the foregoing experiment has been also adapted for the improvement of turf on golf courses, bowling greens, lawns, &c., and is proving a great success. We are bringing the matter prominently before the management of all the golf courses, greens, &c., in our area; and rapid advantage is being taken of it. You will therefore see how you can do something to encourage the use of sulphate of ammonia, and at the same time assist the country, and improve the golf or bowling greens for your leisure hours. I should like, in passing, to refer to a film on this subject prepared by Nitram, Ltd., which describes very fully the great advantages to be gained by the judicious application of sulphate of ammonia to grassland. It aroused considerable interest when recently exhibited in Edinburgh.

NET COST OF COAL.

You will see that I have shown on Statements Nos. 2 and 9, and also in Charts Nos. 13, 14, and 15, the average prices and the net costs of coal per ton, and per 1000 c.ft. of gas after deducting the value received for residuals. It is remarkable how closely the figures correspond year by year, and how quickly the price advances when any disturbing factors arise. This is very noticeable in 1891-92-93, immediately after the great railway strike, from 1917 to 1922, following the great war, during the strike of 1921, and again in the protracted coal dispute of 1926. In Chart No. 11 and Statement No. 9, already discussed, is shown the return from each of the residuals per ton of coal; and the importance of the yield will be readily understood. Although you will notice, in Chart No. 15 and Table No. 9, how coal has advanced in price, you will at the same time observe that the improved amount from residuals and the market valuation of these have come to our assistance, especially in times of stress.

Taking the two extremes, we find from Tables Nos. 2 and 9 and Chart No. 13 that in 1889 and 1890 the net cost of coal was 8s. 6¼d. and 8s. 4¼d. per ton, and in 1925 and 1926 it was 7s. 6¼d. and 9s. 4¼d. respectively; the price of gas being 3s. 6d. per 1000 c.ft. in 1889 and 3s. 6d. in 1926, falling to 3s. 4d. in 1927 and 3s. 2d. in 1928. We have, however, in making this

STATEMENT No. 9.—(Charts Nos. 13, 14, and 15.)

Gross and Net Cost of Coal, and Return from Residuals per Ton. From 1889 to 1927.

Year.	Average Cost of Coal per Ton. Gross.	Return from Residuals per Ton of Coal.					Net Cost of Coal per Ton.	Net Cost of Coal per 1000 C.Ft. of Gas Sold.
		Coke.	Tar and Liquor.	Toluole and Benzole.	Sulphate of Ammonia.	Total.		
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1889	11 9·83	0 9·92	2 5·04	..	..	3 2·96	8 6·87	0 11·71
1890	11 7·80	0 10·29	2 5·06	..	..	3 3·35	8 4·45	0 11·17
1891 (railway strike)	16 0·96	1 2·94	2 11·67	..	..	4 2·61	11 10·35	1 4·01
1892	18 6·34	0 10 64	2 3 69	..	..	3 2·33	15 4·01	1 8·36
1893	17 1·05	0 7·21	1 7·89	..	..	2 3·10	14 9·95	1 7·06
1894	13 3·54	0 8·90	2 8·56	..	..	3 5·46	9 10·08	1 0·24
1895	12 10·14	0 11·11	2 9·63	..	..	3 8·74	9 1·40	0 11·25
1896	11 7·83	0 8·80	1 11·82	..	..	2 8·62	8 11·21	0 11·35
1897	11 2·54	0 9·15	1 9·48	..	..	2 6·63	8 7·91	0 11·14
1898	10 9·08	0 8 27	1 7·10	..	..	2 3·37	8 5·71	0 10·01
1899	10 11·62	0 8·28	2 0·85	..	..	2 9·13	8 2·49	0 8·90
1900	12 9·52	1 5·42	2 11·25	..	..	4 4·67	8 4·85	0 8·75
1901	16 11·56	2 3·88	2 2·30	..	..	4 6·18	12 5·38	1 1·50
1902 (new works started at Granton)	14 2·27	1 2·95	1 4·50*	..	1 2·12	3 9·57	10 4·70	0 11·11
1903	13 1·96	1 5·98	2 2·10	..	1 8·88	5 4·96	7 9	0 7·63
1904	13 0·92	1 10·62	1 11·34	..	2 1·65	5 11·61	7 1·31	0 8·01
1905	12 4·59	2 1·66	1 5·92	..	2 3·61	5 11·19	6 5·40	0 7·00
1906	12 1·47	2 1·15	1 6·63	..	2 3·38	5 11·16	6 2·31	0 6·55
1907	11 7·81	2 7·63	1 5·22	..	2 3·15	6 4·0	5 3·81	0 5·56
1908	14 0·11	3 8 30	1 5·17	..	2 2·52	7 3·99	6 8·12	0 6·72
1909	12 6·2	3 3 11	1 4·25	..	1 11·82	6 7·18	5 11·02	0 6·48
1910	10 0·1	3 3·07	1 1 94	..	2 1·80	6 6·81	3 5·29	0 3·51
1911	10 4	3 4½	1 4	..	2 7	7 3·5	3 0½	0 3·53
1912	10 4	3 6	1 10	..	2 11	8 3	2 1	0 2·33
1913	11 0·4	4 9	2 3	..	2 10½	9 10½	1 1 9	0 1·44
1914 (great war)	13 6	3 10	2 2½	..	2 5	8 5½	5 0½	0 5·85
1915	12 9·6	3 3	1 8	..	2 6	7 5	5 4·6	0 5·99
1916	15 3·5	5 9½	1 6	..	3 1	10 4½	4 11	0 5·44
1917	18 2	6 7	1 3	2 0½	2 9	12 7½	5 6½	0 6·45
1918 (armistice)	19 6	5 10	1 7	2 0	2 4	11 9	7 9	0 8·54
1919	22 4	8 0½	2 1	1 1	2 10½	14 1	8 3	0 8·92
1920 (amalgamation)	26 4	10 3	3 8	..	3 4	17 3	9 1	0 9·35
1921 (coal strike)	34 9	12 5½	6 8½	..	2 8	21 10	12 11	1 1·03
1922	35 2	10 6	3 1	..	1 7	15 2	20 0	1 4·58
1923	22 1	8 3	5 10	..	2 4	16 5	5 8	0 4·85
1924	24 7	10 10	6 2½	..	1 6	18 6½	6 0½	0 5·37
1925	23 8	10 0	3 3½	..	1 10	15 1½	8 6½	0 7·33
1926 (coal dispute)	20 9	6 7	3 10½	..	0 11	11 4½	9 4½	0 7·98
1927	36 10	11 11	5 7	..	0 5½	17 11½	18 10½	1 4·12

*Tar.

comparison, to keep in mind the relative value of money during these periods, and also the greater costs of coal and other materials, the higher rates of wages paid, and the shorter hours worked in 1926 and following years, in order to realize how the present position has been reached only through higher efficiencies and greater economies, and by the practical application of scientific, mechanical, and chemical developments to our working arrangements.

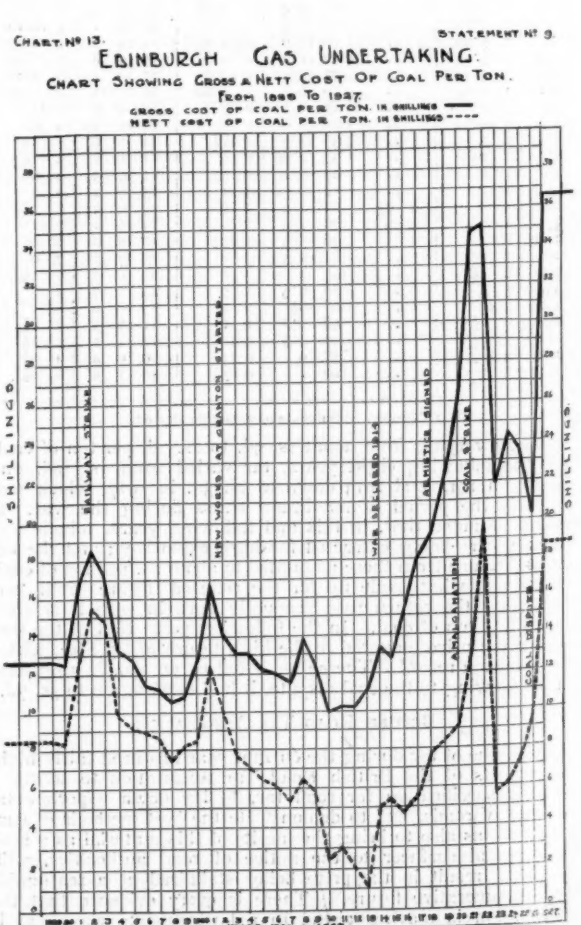
In order to make the data as complete and valuable as possible, as a correct record, I have added in Chart No. 12 and Statements Nos. 7 and 8 the average prices per ton for coke, sulphate of ammonia, and tar over the past 25 years. The increased market value of coke is probably the most striking; but this has been obtained chiefly by greater attention to its production, quality, quenching, selection, grading, &c., and the cultivation of fresh outlets for its utilization.

Charts Nos. 3 and 14 (Statements Nos. 2 and 9), illustrating the net cost of coal per 1000 c.ft. of gas sold, will repay close scrutiny. Starting off with 11·71d. in 1889, and discarding the periods of disturbance, we find that over the first ten years it was fairly uniform. From then during the next fifteen years it had been gradually reduced from 8·90d. to 1·44d. per 1000 c.ft. in 1913, which represents the lowest point reached. Then followed the war and trade disputes, and the net cost rose steadily to 1s. 4·58d. per 1000 c.ft. in 1922, falling again in 1923 to 4·85d., rising last year to 1s. 4·12d. owing to the coal dispute.

Labour and Cost of Carbonizing.

The amount of wages spent in carbonizing, per 1000 c.ft. of gas made, and its relation to the price of gas, have always formed an interesting and fascinating study, and a gauge of the efficiency of the carbonizing plant. In 1889 the amount appearing as wages in the accounts is 5·33d. per 1000 c.ft., compared with 1·87d. for the year 1926-27. These latter figures are, however, classified under the heading of "Carbonizing." If we add the item "Salaries and Other Wages" in both instances, the figure for 1889 is 5·61d. and for 1927 3·41d. Taking into account that wages rates have advanced over 100 p.ct., and allowing for this, the figures for 1927, on the 1889 basis, would be 1·70d., or less than one-third of the 1889 costs. These figures raise the question of the class of labour employed, the nature of the work, and the remuneration paid to those engaged in the production of gas, now and 40 years ago. The investigation throws considerable light on the subject; but before discussing it, let me say that the men, as a whole, in those former days were drawn from among the strongest and healthiest in the community, and that they thrived on the work.

While on the subject of labour, I should like to record that



we had some champion weight lifters and hammer throwers in the squad; and the gas-works had a tug-of-war team which beat all-comers at a memorable contest in the Waverley Market in the nineties, when all the champion teams were present, including those from the army, the police, and other works.

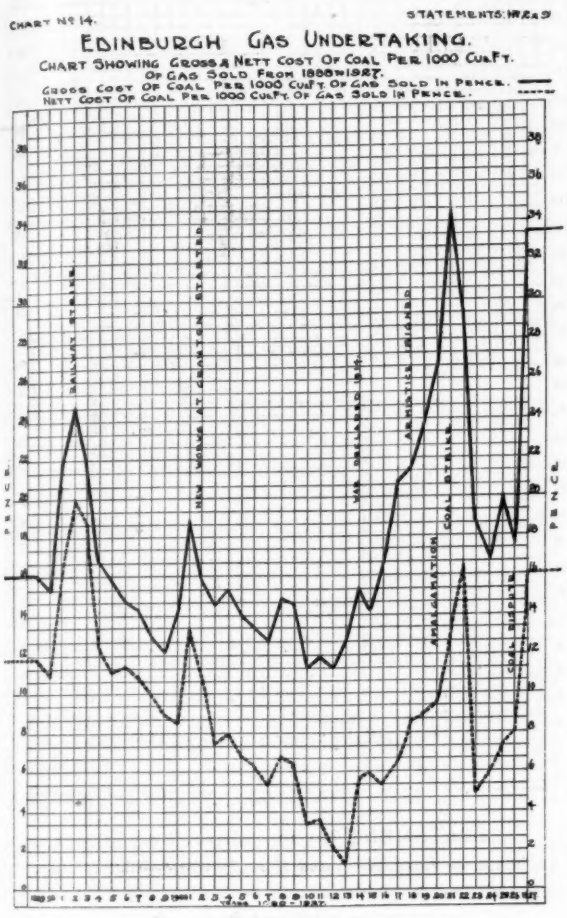


CHART Nº 14.
STATEMENT Nº 9
EDINBURGH GAS UNDERTAKING.
CHART SHOWING GROSS & NETT COST OF COAL PER 1000 CU.FT. OF GAS SOLD FROM 1889 TO 1927.
GROSS COST OF COAL PER 1000 CU.FT. OF GAS SOLD IN PENCE.
NETT COST OF COAL PER 1000 CU.FT. OF GAS SOLD IN PENCE.
PENCE
YEARS 1889 - 1927

Old and New Methods Contrasted—Labour.

Need I recall the heavy physical strain on the men at the old works, due to the great amount of labour which had to be performed by hand—such as the unloading of coal, the filling of bogies, the wheeling of these about the retort house, the hand charging of the retorts, the lifting and wheeling out of the ashes, &c.? Notwithstanding all this, the men kept in excellent health, and many are alive to this day, enjoying their well-earned pensions. Indeed, it has been said that vital statistics prove the gas-workers to be among those having the longest average lives. In contrast to the above, the present methods have led to the term "kid-glove job;" and while it is not quite so, the large amount of machinery employed and the simplification of the processes, calling chiefly for greater intelligence, are most marked.

From inquiries I have made, I learn that at present there are 124 men drawing pensions under the Superannuation Scheme. These pensions and contributions to the Superannuation Fund require £9274 per annum. The average age of the men is 70; the oldest being 83 years of age, and the greatest length of service, 47 years.

Number of Men Employed in Manufacture and Distribution.

As regards numbers, the records show that in 1889 there were 546 men engaged at the two manufacturing stations (Edinburgh and Leith), and 167 men on distribution and other work—making a total of 713. To-day there are at the Granton Works 430 employees; but in distribution, &c., 465—a total of 895. Thus, while there is a decrease of 21 p.ct. in the number employed at the works, there is an increase of 64 p.ct. in those engaged in distribution. This demonstrates that, whereas improved modern plant and machinery and efficiency of the process have displaced a number of men, at the same time reducing the physical strain and bettering the working conditions, this has been more than compensated for by the increase in the numbers employed in other branches of the operations, chiefly on the distribution and sales side.

Rates of Wages and Hours of Work.

Turning to the wage bill, we see that the rates paid to labourers in 1889 was 5d. per hour and 21s. 3d. per week of 51 hours. Stokers, 6½d. per hour and 30s. 4d. per week, average 56 hours. Whereas the present wages are:—Labourers 1s. 1¾d. per hour and 52s. 3¾d. per week of 47 hours; stokers 1s. 4·7d. per hour and 78s. per week averaging 56 hours.

These weekly wages represent advances of nearly 146 p.ct. to the labourers with shorter hours, and 157 p.ct. to the stokers; the work in both cases being much lighter, carried out under greatly improved conditions, and requiring much less physical effort.

Purification—Materials and Costs.

Considerable changes have taken place in this process, in both the material used and method of handling—indeed, in the plant itself useful alterations have been introduced. As regards the material, this used to be entirely lime; but after the transfer to Granton, oxide of iron was employed. As oxide can be revivified and utilized over and over again, the purifying shed, from being a building of one storey at New Street became a double storeyed one at Granton—the lower floor being used for the purifiers themselves, and the upper one for storing and revivifying the oxide. It will be realized that extra labour for turning over and aerating the oxide is involved, even allowing for the slaking and preparation of the lime. This, however, is compensated for by the oxide, when fully fouled, being sold for the sulphur accumulated in it, which in some cases almost repays the first cost.

Purification costs in 1889 amounted to 0·89d. per 1000 c.ft. of gas made; but in 1927 they were 0·14d. per 1000 c.ft.—equivalent to one-seventh of the former charge, notwithstanding the increased rates of wages. This markedly illustrates the important advances made, and the savings effected, in this part of the manufacturing process.

Repairs and Maintenance of Works and Plant.

The costs under this heading as a comparison are not always altogether conclusive. It will be noticed that, as the plant grows old, and is reaching the obsolete stage, the costs become higher; whereas, after a large renewal or reconstruction the charges under this head are generally smaller for some time. However, the relative figures will be interesting. In 1889 we learn from the accounts that the cost of repairs per 1000 c.ft. of gas made amounted to 1·35d. and in 1927 to 2·70d.

The cost in 1927 therefore represents exactly double that of

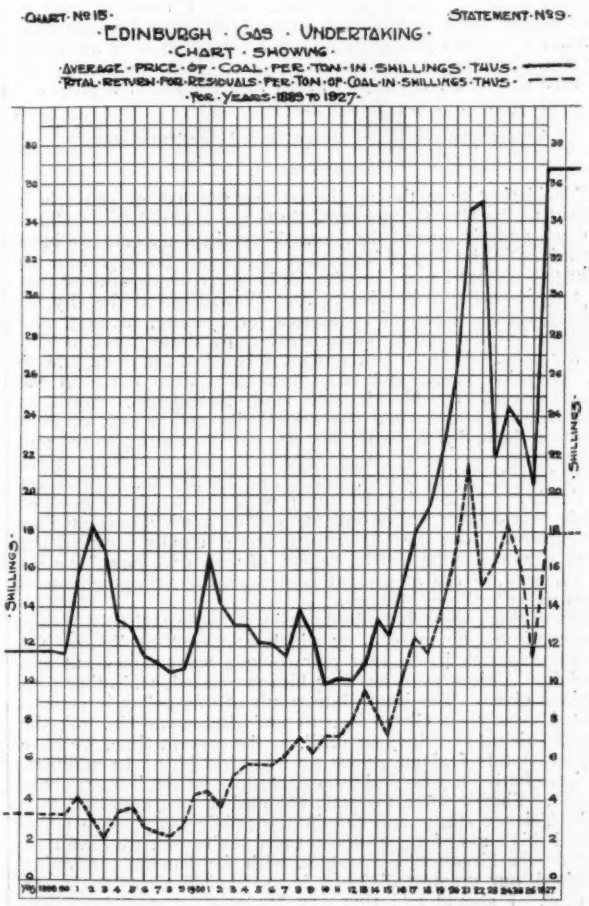


CHART Nº 15.
STATEMENT Nº 9
EDINBURGH GAS UNDERTAKING.
CHART SHOWING
AVERAGE PRICE OF COAL PER TON IN SHILLINGS THUS
TOTAL RETVEN FOR RESIDUALS PER TON OF COAL IN SHILLINGS THUS
FOR YEARS 1889 TO 1927.
SHILLINGS
SHILLINGS
YEARS 1889 - 1927

1889. This can in large part be explained by the increased costs of materials and wages, which may be taken at over 100 p.ct. advance. There is, however, distinct progress shown by the latter figures, as the plant, especially for carbonizing, is of a much more intricate nature, and subjected to so much

higher temperature that its upkeep is more costly. Further, we had not in 1927 obtained the full advantage of our new verticals. On this point, however, I might add that, while one section of the plant may be new and working at highest efficiency, another section may be ready for replacement. Furthermore, notwithstanding the introduction of a new installation, it is always wise and prudent finance to put aside annually a sum for repairs and renewals, so that, when these arise, a sudden heavy call may not be made on revenue, necessitating in some cases raising the price of gas—a contingency which should always be avoided where possible.

Mileage of Mains.

The length of mains in use to-day and 40 years ago can now be considered. The records of these are not quite complete, owing to the transfer of the two Companies and the changes arising through the cutting-off of duplicate mains in the principal streets, and the retention only of the largest and most suitable pipes. However, we find that in 1903, after adjustments had been made, there were 378 miles of mains in use, whereas to-day there are approximately 500 miles. These are providing gas throughout an area of 52 square miles, extending from Joppa in the east to Balerno in the west, and beyond Gilmerton in the south. This compares with about 15 square miles supplied in 1888. I have calculated the consumption per mile of main, and find 4,707,000 c.ft. by 222 consumers in 1903, and 6,164,000 c.ft. by 230 consumers per mile in 1927; so that, while the number of consumers per mile has remained almost stationary, the consumption per head has very materially advanced—indeed, by upwards of 30 p.ct.

Distribution.

To develop the comparison of costs under the heading of distribution, I give the relative figures for 40 years ago and now—viz., 2·28d. in 1889 and 6·97d. in 1927 per 1000 c.ft. sold. From the latter figure fall to be deducted sundry revenues from sales, fittings, and fire rentals—1·66d. in all, leaving a net cost of 5·37d. Half or thereabouts of this increase is no doubt due to the higher costs of labour and materials, and the remainder to the wider scope of operations in this section—such as the lending, hiring, and hire-purchasing of appliances and their upkeep. It also includes the sales organization and other activities; so that, considering all these additions, and the advantages accruing, the expenditure is not really heavy in proportion to the work accomplished. May I mention that in 1888 rentals were charged for meters, and these brought in a revenue of about 1·58d. per 1000 c.ft.? But they were abolished by the Commissioners after that year. It is interesting to observe the idea cropping-up again in the form of a proposed two-part system of charge for gas.

Appliances on Loan, Hire, and Hire-Purchase, Showrooms, &c.

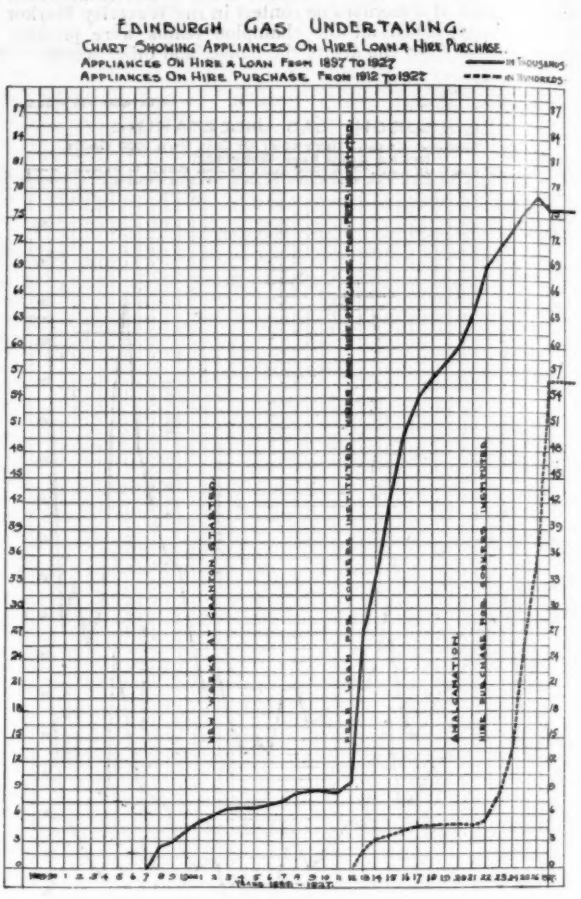
Considering now the appliances for the use of gas which belong to the Gas Department, these are referred to on Chart No. 16 and Statement No. 10. Very little appears to have been done in the way of hiring-out or loaning gas apparatus on a large scale until 1912. It should, however, be mentioned that in 1903 it was first decided to rent showrooms in the city, to display various types of appliances for cooking, heating, and lighting by gas, and to demonstrate how these could be efficiently used. A showroom was established at the main offices, 25, Waterloo Place, and two showrooms were taken in the suburbs—viz., at Morningside and Newington. Business gradually expanded; and the desirability and benefit of such depôts (which, by the way, we also use as district stores and workshops) were soon recognized, and other showrooms were opened at Maitland Street, Leith, and Portobello. This form of dealing and keeping in touch with the public is now so firmly established, so convenient, and so much appreciated by the consumer that the Department has gradually acquired the proprietorship of the district depôts, of which we now have six in all, and we are at present contemplating fitting-up one of them as an "all-gas" house.

Gas cookers were first hired-out in 1897-98; and this system was continued up to 1912, by which time 9408 appliances had been so connected. In that year cookers were loaned out and fixed free. Fires were hired or hire-purchased, and other concessions given. The immediate result of this policy is demonstrated clearly on Chart No. 16 and Statement No. 10; the demand rising year by year until, at the present time, we have a grand total of about 77,000 on loan and hire. In addition, we have between 5000 and 6000 apparatus on the hire-purchase system. Shortly after the war, the cooker was improved to a high-efficiency status and caught the public fancy. We popularized this class of apparatus so successfully that we have now 3717 on the hire-purchase system, with the demand continuing—indeed, our greatest difficulty is to get delivery of the goods in time. I should add that our business in appliances purchased outright has simultaneously reached very considerable dimensions.

Rates and Taxes.

This review would not be complete without some reference to the vexed and much debated question of rates and taxes. A comparison between the figures of 1889-90 and now will show how this burden has grown. As these charges have an important effect on the selling price of gas, I have given them year by year in total and per 1000 c.ft. of gas sold. In 1890 they amounted to 1·73d. and in 1926 to 5·02d. per 1000 c.ft.—the latter exclusive of income-tax, which in that year represented 1·45d., or a total of 6·47d. In 1927, the corresponding figures were 3·67d. and 0·57d. respectively—totalling together 4·24d. This advantage has been secured through a reduction in the valuation of the undertaking, and other financial adjustments. We are also looking forward to some measure of relief from the operation of the New Rating (Scotland) Bill, as,

CHART No. 16. STATEMENT No. 10

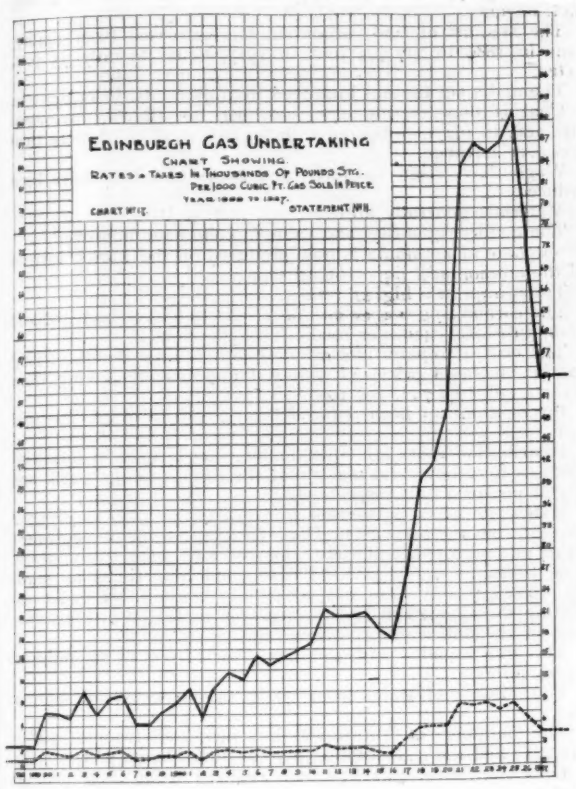

EDINBURGH GAS UNDERTAKING.
CHART SHOWING APPLIANCES ON HIRE, LOAN & HIRE PURCHASE.
APPLIANCES ON HIRE & LOAN FROM 1897 TO 1927
APPLIANCES ON HIRE PURCHASE, FROM 1912 TO 1927
IN THOUSANDS
IN HUNDREDS
HIRE & LOAN FOR COOKERS INSTITUTED. HIRE & HIRE PURCHASE FOR FIRES INSTITUTED
HIRE PURCHASE FOR COOKERS INSTITUTED
AMALGAMATION
HIRE & LOAN SYSTEM AT CRANSTON STREET

STATEMENT No. 10.—(Chart No. 16.)

Appliances on Loan, Hire, and Hire-Purchase—1898 *to* 1927.

Year.	On Loan and Hire—includes Cookers, Boiling Rings, Grillers, Hotplates, Oven Burners, Fires, and Radiators.	On Hire-Purchase—includes Cookers and Fires.
1898	2,440 Hire	..
1899	3,265	..
1900	4,127	..
1901	5,379	..
1902	6,051	..
1903	6,463	..
1904	6,773	..
1905	6,856	..
1906	7,156	..
1907	7,517	..
1908	8,234	..
1909	8,689	..
1910	8,843	..
1911	8,957	..
1912	9,408	..
1913	26,375 Free loan	187
1914	35,181	313
1915	43,873	388
1916	50,094	439
1917	54,368	462
1918	56,433	473
1919	57,853	476
1920	61,116	476
1921	63,920	478
1922	68,174	515
1923	69,975	844
1924	73,884	1380
1925	75,757	2638
1926	77,442	3601
1927	76,362	5672

prior to its introduction, the Department had been very much overtaxed—indeed, it was one of the largest contributors to the local rates of the city. I have shown the amounts and relative charge per 1000 c.ft. in Chart No. 17 and Statement No. 11.


EDINBURGH GAS UNDERTAKING
CHART SHOWING
RATES & TAXES IN THOUSANDS OF POUNDS STG.
PER 1000 CUBIC FT. GAS SOLD IN PENCE.
YEARS 1889 TO 1927.
CHART Nº 17.
STATEMENT Nº 11.

STATEMENT No. 11.—(Chart No. 17.)

Rates and Taxes in £ or Pounds Sterling and per 1000 *C.Ft. of Gas Sold Yearly from* 1889 *to* 1927.

Year.	Amount. £ s. d.		Per 1000 C.Ft. Sold. d.
1889	3,684 18 4		0·89
1890	8,300 16 2		1·73
1891	7,943 0 6		1·53
1892	7,202 5 2		1·41
1893	10,713 1 0		2·09
1894	7,082 13 1		1·33
1895	10,017 2 1		1·75
1896	10,053 5 10		1 70
1897	6,360 12 8		1·01
1898	6,568 19 6		1·01
1899	8,848 11 11		1·29
1900	9,622 2 7		1·33
1901	12,096 15 5		1·65
1902	7,352 7 4		0·99
1903	12,129 11 1		1·61
1904	13,645 3 0		1·78
1905	12,923 12 10		1·68
1906	15,942 16 4		2·07
1907	14,518 3 10		1·80
1908	15,184 12 2		1·88
1909	16,527 11 2		2·11
1910	17,387 18 2		2·12
1911	22,923 13 9		2·90
1912	21,051 5 2		2·68
1913	21,194 3 2		2·59
1914	21,961 19 4		2·61
1915	19,024 8 9		2 30
1916	18,082 12 9		2·23
1917	26,517 15 3		3·39
1918	40,243 17 10		4·88
1919	42,277 12 5		5·05
1920	50,712 18 2		5·54
1921	83,113 3 4		8·86
1922	87,672 8 5		8·78
1923 (rates and taxes)	62,948 14 5		6·40
(income-tax)	23,177 3 5		2·36
		86,125 17 10	8·76
1924 (rates and taxes)	55,794 15 11		5·30
(income-tax)	31,678 2 5		3·00
		87,472 18 4	8·30
1925 (rates and taxes)	58,089 10 10		5·36
(income-tax)	33,459 1 6		3·09
		91,548 12 4	8·45
1926 (rates and taxes)	57,202 9 10		5·02
(income-tax)	16,529 18 1		1·45
		73,732 7 11	6·47
1927 (rates and taxes)	46,813 7 10		3·67
(income-tax)	7,336 9 5		0·57
		54,149 17 3	4·24

Detailed Items of Expenditure Included in Price of Gas—1888 to 1890 and 1925 to 1927.

Chart No. 18 and Statement No. 12, which show the charges per 1000 c.ft. for the various items contributing towards build-

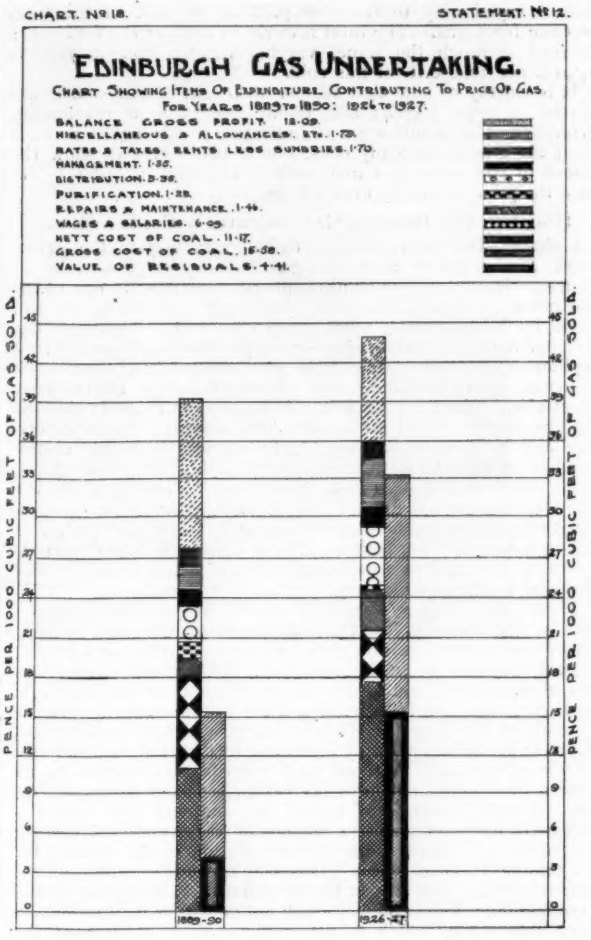


CHART. Nº 18.
STATEMENT. Nº 12.
EDINBURGH GAS UNDERTAKING.
CHART SHOWING ITEMS OF EXPENDITURE, CONTRIBUTING TO PRICE OF GAS.
FOR YEARS 1889 TO 1890: 1926 TO 1927.
BALANCE GROSS PROFIT. 12·09.
MISCELLANEOUS & ALLOWANCES. ETC. 1·79.
RATES & TAXES, RENTS LESS SUNDRIES. 1·70.
MANAGEMENT. 1·30.
DISTRIBUTION. 3·36.
PURIFICATION. 1·23.
REPAIRS & MAINTENANCE. 1·46.
WAGES & SALARIES. 6·09.
NETT COST OF COAL. 11·17.
GROSS COST OF COAL. 16·58.
VALUE OF RESIDUALS. 4·41.
PENCE PER 1000 CUBIC FEET OF GAS SOLD.
1889-90
1926-27

STATEMENT No. 12.—(Chart No. 18.)

*Detailed Items of Expenditure Included in Price of Gas—*1888 *to* 1890 *and* 1925 *to* 1927.

—	1888–89. Cost per 1000 C.Ft. Sold.		1889–90. Cost per 1000 C.Ft. Sold.		1925–26. Cost per 1000 C.Ft. Sold.		1926–27. Cost per 1000 C.Ft. Sold.	
	d.	P.Ct.	d.	P.Ct.	d.	P.Ct.	d.	P.Ct.
Net cost of coal, oil, and coke	11·71	28·3	11·17	27·10	9·43	23·16	17·86	39·77
Wages and salaries	6·27	15·3	6·90	16·74	4·12	10·12	3·66	8·15
Repairs and maintenance	1·51	3·6	1·46	3·54	3·29	8·08	2·89	6·44
Distribution, less meter rents	0·70	1·7	3·53	8·56	6·02	14·78	5 31	11·82
Rates, taxes, rents, less sundries	0·81	2·1	1·70	4·13	6·42	15·77	4·38	9·75
Management	1·21	2·9	1·35	3·28	1·86	4·57	1·73	3·85
Purification	1·04	2·5	1·23	2·98	0·16	0·39	0·16	0·36
Allowances, &c.	0·89	2·3	1·79	4·34	1·19	2·92	1·11	2·47
Balance—gross profit	17·08	41·3	12·09	29·33	8·23	20·21	7·81	17·39
	41·22	100	41 22	100	40·72	100	44·91	100

ing-up the price of gas, are peculiarly instructive. The percentage which each item represents in the total is also worthy of note. The data are practically a collection of the various subjects and costs already discussed in this address, and indicate the amount required under each heading of expenditure, and how these totals have varied as between 1888 to 1890 and 1925 to 1927.

Taking briefly the items enumerated, it is observed that the net cost of coal has fallen slightly both per 1000 c.ft. and in percentage of total cost, though it shows a rise for 1927, which, however, includes the coal dispute. Wages and salaries are reduced both per 1000 c.ft. and in percentage—indeed, roughly, this item has been halved.

Repairs and maintenance are practically double. Distribution

is nearly twice as much per 1000 c.ft., but only slightly up on the percentage basis.

The most striking figure, however, is the balance—being gross profit—which, from 17d. and 12d. per 1000 c.ft. in 1889 and 1890 respectively, representing 41 p.ct. and 29 p.ct. of the total charge, has now fallen to a little over 8d. per 1000 c.ft., and is equal only to from 18 p.ct. to 20 p.ct. of the total revenue from gas. The total revenue in each of the four years detailed is much the same, varying merely from 40·72d. to 44·91d. per 1000 c.ft. of gas sold.

It is worthy of note that 1d. per 1000 c.ft. of gas sold represented in 1890 £4794; and to-day brings in a revenue of £12,765. This would seem to indicate a much higher revenue from the gas, as it really does, but it also serves to show the extent of the economies and savings required in order to reduce the price of gas by even 1d. per 1000 c.ft.

Housing and Health—Gas Industry's Contribution.

I should like before closing to call attention to the great, good, and practical work the gas industry is performing in securing cleaner and purer atmospheric conditions in our towns and cities, dispelling the smoke pall, and so assisting the sun to do its health-giving work more efficiently. This is being accomplished by the introduction of gas-heated, labour-saving appliances—appliances free from smoke, dust, and dirt, work reducing, worry dispelling, and leisure promoting for the busy housewife. What we are doing in Edinburgh towards improving the health of the inhabitants and towards more comfortable and convenient housing conditions will be better understood in relation to the Corporation Housing Schemes. Since 1919, some 3600 houses have been erected; and in these the Gas Department has fitted up over 4000 appliances for cooking—including cookers, hotplates, &c.—about 5000 gas fires, and 1000 gas-heated wash-boilers. These figures demonstrate convincingly the practical assistance that is being given in this direction by the gas industry.

There is one other subject I should like to touch upon—that is, the necessity for the careful compilation and setting-out of the working results daily, weekly, monthly, and yearly, so that they can be readily analyzed. The scientific examination of these facts and figures devolves upon the engineer and manager, who should ever keep them prominently in view as a means of directing the efficient and economical management of the undertaking not only from day to day, but continuously over long periods. Without such records this address in its present form could not have been compiled; but in developing this scientific control—in which our industry has taken a prominent part—we also now endeavour to correlate our costing and statistical records with the preparation of the figures for the annual balance. This gives the necessary guarantee of their reliability, and acts in the direction of unifying the whole organization. Time and space will not permit of further elaborating this work, which would really require an address for itself; but sufficient has been said to indicate its importance.

Summing-up.

There are many other matters upon which I should have liked to touch—such as the great changes which have taken place in the plant and processes; but this address has far exceeded the limits originally intended.

Summing-up, we have seen in this review that the cost of coal has fully doubled during the last forty years, that other materials necessary for carrying on the operations of the gas-works have correspondingly advanced, that distribution is more than twice as much, and rates and taxes between three and four times, that rates of labour are fully two-and-a-half times what they were, and repairs and maintenance about double, and yet the price of gas is substantially lower. In comparison with other commodities such as food, clothing, and other necessaries, I think gas undertakings may take credit for a very useful contribution towards easing the cost of living, besides adding to the health and convenience of the community, and making for a cleaner and more comfortable existence. The industry can also take heart, and look forward to the future with equanimity and without misgiving.

I have made a brief abstract of the various matters discussed, which may be found handy for quick and easy reference. This shows shortly the great alterations and advances which have taken place during the last forty years.

Summary in Detail.

Gas has now been supplied in Edinburgh for over 110 years, and for the past forty years the undertaking has been managed by the municipal authorities.

The total capital expended on works and plant to date is £2,544,527.

The capital outstanding in 1889 was £1,081,303; in 1927 it was only £999,731. Thus it is actually less now by £81,572, although new works have been constructed, very large and important renewals carried out, and new and enlarged plant has been installed.

The area occupied by the works in 1888 was 6½ acres; in 1927, 50 acres. It is therefore now nearly eight times as large.

Business, as represented by annual revenue, has advanced from £219,253 to £792,080, and expenditure from £188,293 to £692,450.

Interest and sinking fund contributions have increased from £46,795 to £99,148. These latter are roughly equivalent to the gross profit; and though larger in amount are now actually less per 1000 c.ft. of gas.

The make of gas is over 2⅝ times that of 1889, having risen from 1,225,194,000 to 3,289,543,000 c.ft., equivalent to a 168½ p.ct. advance.

The amount of coal carbonized has increased from 124,057 tons in 1889 to 217,945 tons in 1927, equal to only 75 p.ct. extra.

The make per ton has improved from 9876 c.ft. to 15,242 c.ft.

Coal is now costing 17s. 10d. per ton (having averaged 36s. 10d. in 1927), compared with 8s. 10d. in 1889, or more than 100 p.ct. advance.

Wages have risen 150 p.ct., and hours of labour have been reduced.

Materials generally are over 100 p.ct. dearer.

The quality, quantity, and value of coke have improved.

Sulphate of ammonia is now produced on the works, instead of the ammoniacal liquor being sent away.

Tar brings in a higher return.

The carbonizing wages and other charges have been reduced from 5·61d. to 3·41d. per 1000 c.ft. of gas made.

The cost of repairs and maintenance is now double, owing to the increased prices of material and labour—having risen from 1·35d. to 2·70d. per 1000 c.ft.

Purification has been reduced from 0·98d. to 0·14d. per 1000 c.ft.

Distribution costs are fully double, due largely to increased charges for labour and materials; the figures being 2·28d. and 5·37d. per 1000 c.ft. respectively.

Rates and taxes have risen from £8300 in 1890 to £73,732 in 1926 (having been as high as £91,548 in 1925)—equivalent to 1·73d. and 6·47d. and 8·45d. per 1000 c.ft. respectively, nearly nine times as much in hard cash, and four times as much per 1000 c.ft. We are now obtaining some relief under the Rating (Scotland) Bill and through the reduction in the valuation of the undertaking.

The area supplied with gas has grown from 15 sq. miles to 52 sq. miles.

The mileage of mains from 378 in 1903 now extends to over 500.

The number of consumers has increased from 61,920 to 114,234; and the consumption per consumer by 70 p.ct.

Unaccounted-for gas has been reduced from 10·57 p.ct. to 6·16 p.ct.

A system of loaning, hiring, and hire-purchasing of appliances has been adopted. The number of these appliances now in use is about 86,000; and they have all to be looked after and maintained in good order.

There are also six showrooms throughout the city and suburbs.

The price of gas, which was 3s. 6d. per 1000 c.ft. in 1889, and was up to 5s. 8d. in 1921, has been reduced to 3s. 2d. per 1000 c.ft.

There were separate engineers in charge of each of the old works, making 400 million and 800 million c.ft. per annum respectively. One engineer is now in charge of the entire undertaking, making 3289 million c.ft. per annum.

In drawing to a close, and analyzing the foregoing review, I think you will agree that it indicates the much heavier responsibilities now attached to the provision of a gas supply, and also how the duties of those at the head of affairs have grown and multiplied year by year. It is pleasing to observe, however, in other directions the easier and simpler conditions under which the young men of to-day can obtain their training in the industry and the greater facilities provided by the Education Scheme, as well as the large amount of data and literature which are ready to hand.

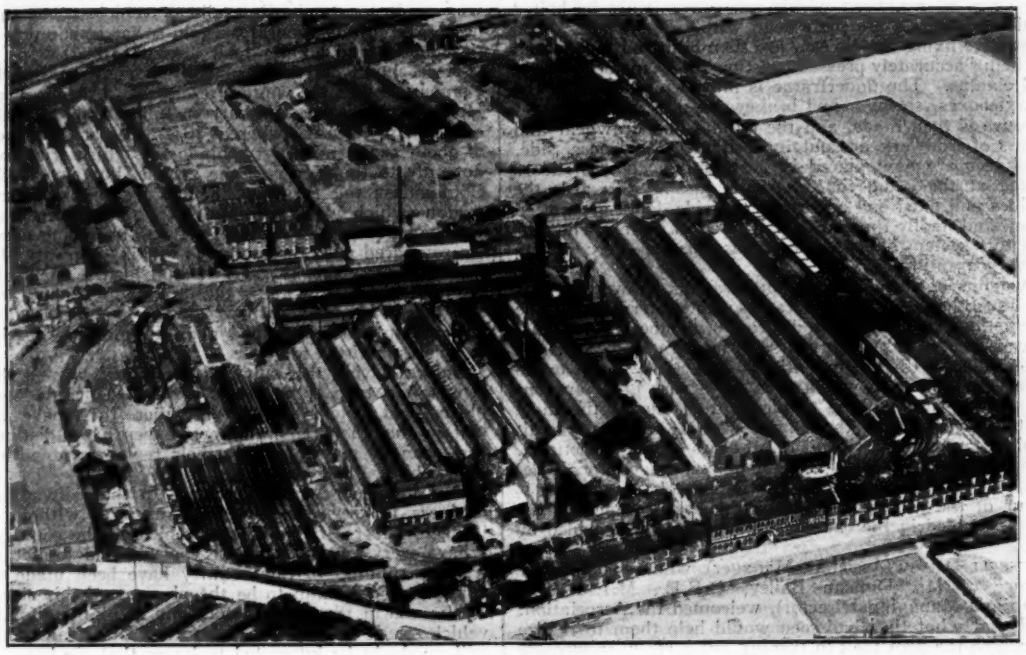
In exhorting the younger generation to take every possible opportunity of acquiring a thorough grounding in their business, and to make full use of the facilities provided, I cannot do better than ask them to take to heart the sage advice contained in these wonderful, subtle, and oft-misquoted lines of Pope:

> A little *learning* is a dangerous thing,
> Drink deep, or taste not the Pierian spring,
> There, shallow draughts intoxicate the brain,
> And drinking largely sobers us again.

Safety Precautions for Machinery at Mines.—The Secretary for Mines announces the publication of Mines Department Safety Pamphlet No. 5, which deals with fencing and other precautions in connection with the use of machinery at mines. The object of the pamphlet is to emphasize the dangers which arise from lack of protection of the moving parts of machinery, and to help to promote generally a knowledge of the most effective safeguards for different kinds of machinery under the varying conditions of use. The pamphlet contains chapters devoted to transmission machinery, to haulage and other plant used underground, and to the surface plant commonly used. Copies of the pamphlet can be purchased price 6d. net (by post 7½d.) through any bookseller or directly from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to Wagon Works.



AIR VIEW OF MESSRS. CHARLES ROBERTS' WORKS.

On April 18 the Association, accompanied by their President, Mr. C. H. Chester (Wakefield), visited the Railway Wagon, Wheel, and Spring Works of Messrs. Charles Roberts & Co., Ltd., Horbury Junction, near Wakefield. The works cover 36 acres, and the members were given the opportunity of a thorough inspection of all departments. Commencing at the wheel press shop, the visitors were enabled to see the large 1200-ton wheel press utilized for bossing up the centres, after which the rim is glutted up under special hydraulic presses. The wheel machine shop was next visited, and here a very fine axle centering and ending machine was in operation; the axle ends being cut off to length simultaneously, and the outer radius being formed at the same time, thus ensuring a truly centred axle accurate to length. The axles, tyres, and wheel centres, after being machined, pass down the shop, where the tyre is heated and shrunk on to the centre. After this the wheels are pressed on to the axle by a special hydraulic press with recording apparatus denoting the exact tonnage at which the wheel was pressed into position.

On leaving this department, the visitors were conducted to the iron foundry, where axleboxes of the divided type with diaphragm oil wells, buffers, cylinders, and numerous other castings were being moulded and cast.

The axlebox fitting shop attached to the foundry is considered one of the most important sections of the works. Here, the axleboxes are tested with a horseshoe gauge to ensure that the spring seat is in true alignment with the axleguard grooves. A further gauge ensures that the brass seat is in true alignment with the axleguard grooves, and a combination of these two gauges accurately locates the spring seat, bearing seat, and axleguard grooves. The joining of the two halves of the box is made with a V joint; and to ensure absolute interchangeability, each half of the box is gauged with a specially formed gauge, ensuring accuracy in this direction. The bearing seat is further tested to ensure that it is truly flat, and finally the box is bolted up, with oil hole lid and dust shields complete, ready for dispatch to the wagon erecting shop. All the gauges used are supplied direct by the London, Midland, and Scottish Railway Company.

The brass foundry, close at hand, was inspected, where the shells of the axlebox bearings were being cast.

The tank building and riveting department was visited. Here tanks for the conveyance of tar, ammoniacal liquor, and oils of all description were in progress of manufacture. The large steel sheets from the rolling mills were being marked, punched and drilled, and rolled to shape to form the tank barrel. The pressed ends and splash plates were being fitted; and finally the riveters' work was seen where hundreds of rivets per day are put in by means of pneumatic hammers. All joints and rivets are caulked both inside and out, and finally tested to a hydraulic pressure of 25 lbs. per sq. in. Leaving this work behind, the visitors were conducted through the forge.

The blacksmiths' shop was busily engaged making coupling links and welding-up and forging the lighter types of ironwork, all of which then pass forward into the fitting shop, afterwards going to the ironworks stores. The well-appointed and commodious sawmills then claimed attention.

Messrs. Charles Roberts & Co., Ltd., have evolved a system of wagon erecting on scientific production lines; and in using

Part of the Erecting Shop.

An Example of Messrs. Roberts' Productions.

the expression "scientific production," they certainly can prove that the usual ills attending mass production are not evident in their case. Everything having been accurately prepared, the items are assembled briefly in the following manner. At one end of the wagon shop the underframe members are prepared, and any items of ironwork which can conveniently be bolted and fitted into position are there dealt with. The frames, with their respective fixing knees, &c., are then built, all tenons and mortices being accurately pressed together by means of specially arranged clamps. The underframe is moved forward, and the wheels, axleboxes, springs, and brakework are then fitted. A further move is then made, and the buffing and drawgear and other items of ironwork are put in position. The floors, side, and end knees are next placed in position; the bottom doors being fixed at the same time. Again passing forward, the wagon sides and fixed end are fitted, the side doors are placed in position, and finally the end door is fixed in place. The output from this system of wagon erecting ensures one complete wagon every 25 minutes.

Tank wagons of certain types, and wagons of over 12 tons capacity, must have steel underframes; and after leaving the wagon erecting shop, steel underframe members, channels, angles, tees, &c., were seen in course of preparation. Specially trained men deal with the mounting of the tank barrel on to the cradles—an operation which calls for a very great amount of care. The spring making department is one of the most important departments of these large works; and here laminated, volute, and helical springs of all types are manufactured. Close by the spring shop is the commodious wagon repair department, where repairs of all descriptions are executed.

The tour of the principal shops having been completed, the company assembled in the canteen, where tea was provided by the firm.

Mr. Russell Bailey (Assistant Manager), who apologised for the absence of Mr. Duncan Bailey, O.B.E., M.I.Mech.E. (Chairman and Managing Director), welcomed the Association. He hoped that what they had seen would help them to realize the care which the firm took in turning out a really serviceable product which would meet all the specifications laid down by the railway authorities.

Mr. Chester proposed a vote of thanks to the firm, whom he congratulated on their all-round efficiency.

Mr. S. H. Packer (Bradford) seconded the proposition, which was carried unanimously.

TRANSPORT AND THE GAS INDUSTRY.

By William Lofthouse, Chief Draughtsman to Messrs. Charles Roberts & Co. (1927), Ltd.

[Extract.]

I believe I am correct in stating that the gas industry is the third largest consumer of coal in this country; and consequently our association with you is of an intimate character. I trust to-day's visit will have afforded you a good deal of interest, and that in the future our association, one with another, will be further cemented.

The present works occupies 36 acres. The firm employ over 1000 hands, and in addition have 40 branch repairing works and depôts in all parts of the country; noted branch works being at Manchester, Northwich, Melton Mowbray, and West Ham.

During the sitting of the Coal Commission, we heard a good deal about the private-owner wagon, and we were led to believe that if private ownership was abandoned, and the Railway Companies took over the whole of the transport, it would assist in the reclamation of the coal industry. I think the general experience of most of us will be that since the Railway Companies formed their huge amalgamations, conditions have not altered for the better—rather the reverse.

The private owners have placed approximately 60 millions sterling in the form of railway wagons at the disposal of the Railway Companies, enabling them to carry their freight and make a profit on so doing without having to find capital for the wagon stock.

With regard to the relative cost of carrying your coal in Railway Companies' wagons or in wagons of your own, this, of course, will vary very much with the conditions of the traffic; but as a rough figure, and taking to-day's capital value of a 12-ton wagon at (say) £130, it can be clearly shown that if private wagons are used to the best advantage, making an average of (say) two journeys per week, they will then carry your coal for a figure slightly below 2½d. per ton, which will be sufficient not only to repay the capital cost of the wagon at the end of thirty years, but to give you in the meantime 5 p.ct. interest on the diminishing value of the wagon, and allow also a reasonable amount for repairing and repainting. Or, assuming conditions are such that only half the coal can be carried—that is, one journey per week can be made—the cost per ton of coal carried, giving the same interest and repairs, would still be less than 5d. per ton, and thus show an appreciable margin of profit. Of course, as the capital cost of a wagon goes up or down, the charges will fluctuate in the same proportion; but this figure will probably be near enough to guide you in your calculations.

If any of you are at any time interested in this problem, and would care to give us the opportunity of discussing the matter with you in detail, we should always be pleased to do so, and would work out any set of figures which you might require to show you what it would cost you to carry a given tonnage of coal over any given period.

Probably some of you will be aware that in 1923 an attempt was made to standardize railway vehicles; but this has only been effected in a general sense in so far as running gear, brake gear, draw and buffing gear are concerned.

Here, however, this Company has proved to the Railway Companies that the wagon, as issued to the Railway Clearing House designs, does not carry a full 12 tons of coal. It has a capacity of 534 c.ft., whereas it is necessary to have a capacity of about 560 c.ft. to carry this load. This variation was a loss not only to the owner of the vehicle, but also to the Railway Companies; the variation in cost for the increased depth of wagon (which we now make 4 ft. 7⅝ in. deep instead of the Railway Company's depth of 4 ft. 4½ in.) being almost negligible compared with the increased earning capacity of the wagon through being able to carry its full load. The Railway Companies also were the losers through having to haul less tonnage, and this is a point worthy of your serious consideration, should you at any time be called upon to compare specifications of vehicles submitted to you.

Before leaving this subject, I seriously suggest that the present 12-ton type of wagon is distinctly advantageous over the older 8 and 10 ton vehicles; and where these have reached such a stage that their repairs become expensive, a distinct saving in costs can be guaranteed by their replacement with the larger type vehicle.

Our knowledge and experience in the railway tank wagon business is very extensive, and we are, without doubt, the largest builders of this type of vehicle in the country. In fact, I have every reason to believe you will find 40 p.ct. of the tank wagons running in this country have been made at Horbury Junction. We claim to be the pioneers of this class of rolling stock; and in 1875, long before any regulations for this type of vehicle were issued, we had turned out tank vehicles. You will no doubt be interested to know that we have successfully designed tank wagons to carry hydrochloric acid in bulk, and that a number of these vehicles are running to-day, giving every satisfaction. We have recently turned out a number of nitric acid tank wagons with barrels of stainless steel, and we have also prepared designs for similar tank wagons with barrels made of aluminium. Probably of great interest to you will be the fact that we are now insulating tank wagons for the conveyance of hot tar; and the following data will prove the advantages of this insulation.

1.—*Nov. 19 to 23, 1925—4 days.*

Initial temperature	135° Fahr.
Temperature on arrival at destination	81° ,,

[The weather during the week-end was very cold, and night frosts prevailed. The tar ran freely when discharged without heating and without difficulty, and we consider that this initial test was satisfactory.]

2.—*Jan. 25 to 28, 1926—3 days.*

Initial temperature	166° Fahr.
Temperature on arrival at destination	94° ,,

3.—*Feb. 2 to 5, 1926—3 days.*

Initial temperature	180° Fahr.
Temperature on arrival at destination	115° ,,

4.—*Feb. 12 to 15, 1926—3 days.*

Initial temperature	173° Fahr.
Temperature on arrival at destination	85° ,,

[In view of the extremely cold weather which prevailed at the dates this wagon was tested, we think you will agree the result was very good.]

To makers of tarmacadam, a great saving is effected through being able to obtain the tar or bituminous liquid in such a state that it can be immediately run from the tank wagon and mixed with the necessary stone, &c.

In connection with tank wagons for carrying tar and bituminous liquids, some years ago, in conjunction with some chemical friends, we prepared a design of steam heating system for facilitating the discharge of the tank contents; and this has now been incorporated in the Railway Company's standard drawings. One or two main points in connection with this steam heating system are that any unit can be taken out or replaced without having to enter the tank, and, further, there are no joints in the piping which could develop into leakage points.

You will fully appreciate that, while the contents of the tank are kept heated, the outlet, which is a point subject to all the climatic variations, still remains cold, and without other means the contents cannot be got to flow freely until radiation of heat has taken place from the piping, which in many cases takes a long time. To obviate this, we have designed a steam-heated outlet stool which, working in conjunction with the internal steam heating arrangement, facilitates the flow of liquid immediately.

When you consider that we are turning out over a hundred coal wagons per week, you will appreciate the number of parts that have to be manufactured. Of the 415 parts of ironwork, there are 116 different items; and I do not know of any other wagon works in this country which are making every component part, as we do at Horbury Junction.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

On April 14, at the invitation of the Directors of Messrs. R. & A. Main, Ltd., the Association visited the Gothic Works of the firm at Falkirk.

The visitors were received at the offices by Mr. Kenneth Aird (Chairman), Mr. Jas. A. Maclay (Director), Mr. A. P. Main, Mr. A. Cockburn, and a number of Scottish representatives, and after being divided into small groups were conducted over the works by members of the staff. A number of the workmen, together with the foremen of the various shops, were in attendance—the latter to explain, and the former to demonstrate, the processes involved in the construction of appliances, both domestic and industrial, for the customers of the gas industry.

TOUR OF THE WORKS.

Immediately adjacent to the offices are the laboratories, to which the visitors were first conducted, and where was seen the comprehensive equipment of apparatus and instruments employed in this department for the exhaustive tests carried out on the firm's products. Mr. Arthur Forshaw, the Chief Chemist, was in attendance, and demonstrated the functions involved.

Proceeding, the visitors were shown the drawing office, and, in the pattern making shop, the primary patterns made of wood, plaster, or tin, from which are cast the original iron patterns used in the production of the plate patterns. Two large coke-fired cupolas, each capable of melting 60 tons of metal per day, were then seen. These are used on alternate days. While one is melting, the other is cleaned and chipped ready for use on the following day.

In the moulding shop the visitors passed down the long lines of boxes packed with the plate patterns and the green sand into which the molten metal is run to form the casting. In the core shop the methods employed in the making of cores for burners, &c., with ordinary soft sand, and the ovens in which these are baked hard, were seen; also the rolling and milling machine in which the universal green sand is mixed before reaching the moulding shop. From the latter the castings are passed to the dressing shop, which provides emery wheels for large articles and "rumblers" for smaller. In this department special machinery is used to ensure the best conditions for the workers. In the passing shop all castings are subjected to expert examination, and, if satisfactory, are passed to the warehouse.

The smithy was then inspected. Here all wrought-iron work is prepared; and there are machines for cutting into strips, folding, and punching parts for oven gates, hangers, and grid-shelves, prior to their being riveted. In the machine shop burners for cookers and fires are drilled and machined with the utmost accuracy; special jigs assuring the correct spacing and angle of hole to be drilled. The acetylene welding process employed on the trough crown-plates, &c., was demonstrated.

The assembling shop (of which there are two sections—one for dealing with large appliances, and the other for cookers and fires) was entered. In this shop stringent tests are carried out on the components before and after assembly. A group of stopcocks for cooker rails, for example, was attached to a reciprocating shaft by means of which the plugs were automatically and continuously turned in their barrels. A counter attached to this shaft indicated that the cocks had been operated over 35,800 times, and were still ticking away merrily. Should the metal show any undue wear, the cocks are rejected; otherwise they are passed on for assembling on the gas rail, after which the latter is put under gas at 40 in. water pressure, to detect leakage both in the brass work and in the cast-iron rail. Finally the rail is fitted to the cooker, and in addition to a further test for leakage the injectors are adjusted to suit the calorific value of the gas in the particular district to which the cooker is being dispatched.

In the technical department is an intricate arrangement for testing the operation of the "Mainstat" oven heat controller, by means of which an ordinary oven door is opened every four minutes to allow for the escape of some of the hot air and the entry of fresh cold air. A chart attached to a diaphragm pressure recorder provides a continuous record of the difference in gas pressure from a point on the gas supply pipe to the oven below the "Mainstat."

Adjacent to the assembling shop are the tinsmiths' shops, in which steel, iron, and copper sheets are dealt with in the production of wash-boilers, geysers, cooker linings, &c. In addition to the usual guillotine, rollers, and stamping machines for cooker grill pans, a special machine for rapid cutting into any desired shape or size was demonstrated.

In the finishing shops the Berlin black and japanned finishes are applied either by brush or by spray—principally the latter, on account of the absence of brush marks and the more attractive finish obtainable. The stoving process is carried out in ovens at a temperature of 300° Fahr. The high-class finishes which provide for the treatment of appliances in armour bright, bronze, brass, electro-copper, or nickel, have a separate shop for their application.

There are two enamelling shops. The articles to be treated by the new "Mainamel" process in one shop are first passed through a high-pressure sand-blasting plant. The enamel is applied wet in the form of a spray, and then dried in a hot air oven, following which the casting is put into the muffle furnace for firing.

Following the tour of inspection, the visitors adjourned for tea, at the invitation of Messrs. Main.

Mr. AIRD extended a cordial welcome to the Association. It had often been said, he observed, that the manufacturers and the members of the gas industry could not work too closely together. He felt sure the visit would have been of help to the visitors. They had seen advances which had been made since last they inspected the works—improvements on which the firm had reason to flatter themselves.

Mr. E. L. FARQUHAR (Kennoway and Lower Largo), the President, thanked the firm, who, he said, were to be congratulated on the efficiency apparent in every department of the works, and on their progressive policy.

FLUES AND VENTILATION, WITH SPECIAL REFERENCE TO HOUSING SCHEMES.

By ARTHUR FORSHAW, M.Sc., Chief Chemist to Messrs. R. & A. Main, Ltd.

The needs of the population, the figures given by statistics, and the evidence of our eyes convince us that one of the most active industries at present is that of house building. The pressure of economic circumstances has made it imperative that costs shall be reduced to as low a point as possible, and in a great number of instances mass production methods have been studied, and adopted with advantage. Economies have been, and are being, attempted, however, in one direction which is open to very grave objection; and it is the aim of these remarks to show you the danger and to indicate how it may be dealt with. To put it briefly, the attempt to reduce building costs is taking the form of providing rooms, or offices, with inadequate flues, with no flues whatever, or, what is perhaps worse—because a feeling of confidence is engendered which is unjustified by the facts—with ill-designed flues that will fail in their purpose.

The gas and the gas appliance industries have had such a firm grounding in the necessity for providing adequate ventilation in bedrooms, living rooms, offices, and factories during the last fifteen years or so, that this new development in building practice comes with a great shock. It seems hardly credible that architects and builders, particularly the former, should be so poorly informed, or, alternatively, so reckless, as to expose the occupiers of such houses to grave risks to health for the sake of saving a few pounds in the initial cost.

I want you to realize at this point that we are really considering two subjects. The more general one is that of ventilation, apart from any question of causing it by gas appliances or other definite means; while the other is the more particular one of removing the products of combustion of gas or other domestic appliances.

Modern hygiene demands that adequate ventilation must be provided for all types of apartment. To meet the same demands, gas appliances must be provided with adequate and effective flues. It is the fortunate position of gas that, while meeting these demands for the removal of its own products, the means adopted can be made to serve the former purpose of ventilation. It is for this reason that we are apt to lump the two subjects together, and so, in some cases, to confuse the issue.

However, whatever modern hygiene may demand, we may be sure that where financial considerations are involved some of those responsible for building will only provide such arrangements for ventilation and for products removal as they may be obliged to do by existing building regulations. We naturally inquire then what is the state of the law, who are responsible for passing the plans of new property, and what are their duties and obligations in the matter. I do not wish to go into detail on this side of the subject, and will merely give you an outline sufficient, I hope, for the purpose of enabling you to understand the present position.

So far as Scotland is concerned, the Statute governing the matter appears to be the Burgh Police (Scotland) Act of 1892, which provides for means of ventilation approved of by the town council. In practice this is interpreted as meaning a sufficiently opening window.

It is further laid down that every habitable room shall have at least one window of an area of one-tenth of the area of the room, one half of the window to be made to open full width; and, further, that any habitable room of less than 100 sq. ft. of floor area, and without a fireplace, shall be provided with special means of ventilation to be determined by the town council. This is usually met by making an opening in the wall communicating with the external air, the area of the opening being generally a nominal 9 in. by 9 in.

It will be seen that in Scotland, and the English provisions are much on the same lines, if a room is greater than 100 sq. ft., and is provided with a window as laid down, no fireplace or flue of any sort is required by law. In a room

smaller than this, any form of air-brick or grating leading either to the open air or to a cavity wall may satisfy the local town council. Thus, so far as statutory requirements go, there is no obligation on architects or builders to provide a flue capable of being used with a fire, either coal or gas, whether the room be great or small.

The result of this is that in the absence of fresh legislation or of steps to alter the interpretation by town councils of the existing Act, new property is being built without flues, and the use of gas for fires and the like is being automatically prevented.

Builders.

There is another result which must be briefly mentioned. It is that, as rooms must be warmed at some time or another, the only possible means—by which is meant, of course, the only one which does not incidentally give actual gaseous products of combustion—is electrical; and in the case of bedrooms I have already come across an instance of a builder who justified his omission of flues by saying that he could save £4 to £5 per house, and instal electric heaters which required no flues. Ideas of this sort, which are no doubt held in good faith, are very dangerous; and for their origin and acceptance it is unfortunate that electrical propaganda cannot be held blameless. The average builder could hardly be expected to be an expert in hygiene; and so long as he complies with the law as interpreted by the local authorities, no doubt he considers himself free to accept the statements of an industry, such as the electrical one, which to him is presumably staffed by technical men whose business it is to be acquainted with the various outside sciences with which the satisfactory use of their appliances involves them. Where the builder's acceptance at the same time accords with his desire to save costs, it must be obvious that counter propaganda will have to be very strong and authoritative to affect him. In fact, it cannot do so without the backing of fresh legislation or the conversion of the local authorities to a realization of the underlying hygienic facts. Until he gets this pressure applied to him, he will continue to build rooms without flues, and so compel the occupiers to risk their health—and not only this, but to confine their choice of heating appliances to electrical ones.

Architects.

With regard to architects, we should naturally expect from them a better informed and more exact appreciation of the needs of the tenants in the matter of ventilation. While no doubt this is true of the majority, unfortunately the expectation is in a number of cases hardly justified; and it is these latter who are partly the cause of the trouble under discussion. When these architects are not bemused by the spell of the word electricity, they seem to have little knowledge of the requirements of gas-consuming appliances or of the hygienics of ventilation. Thus, I have met with two cases where 3-in. flue pipe has been specified for gas fires. It is only fair to say that one of these was due, not to an architect, but to the engineer to the town council concerned; and on representations being made to him, he altered his decision. There must be many instances of this sort which do not come to notice until it is too late for alterations to be made to the plans—which is all the more reason for now trying to ensure that such cases cannot recur.

It is interesting to contrast the above lax state of the law and its interpretation with regard to dwelling houses, with the very different state of affairs when factories and workshops are in question. Under the Factory Acts it is laid down that the purity of the air must not be unduly interfered with; and though an exact definition of purity has never attained the status of legislation, such definition has been put forward by a Home Office Departmental Committee, and in practice the Factory Inspectors base their action on the Committee's recommendation. This was to the effect that the CO_2 must not exceed 12 parts per 10,000 of air during the day.

Obviously, what is required in every room not provided with a fireplace or chimney—whether bedroom or office—is a ventilating shaft that will work under all conditions of wind and weather. Now, for various reasons, with which I will deal later, no mere opening through the wall to the open air or into a cavity wall is satisfactory. It may also be remarked that it is the usual experience to find that gratings and the like in small property have been blocked up in cold weather by the occupants of the room. To meet all requirements of ventilation, a shaft of some sort discharging above the level of the eaves is required.

It is in this direction that we can, as an industry, help the cause of hygiene and at the same time assist ourselves by influencing architects and builders to provide flues suitable for gas fires in all rooms where a firegrate and chimney are not installed. If use is made of the latest devices for the purpose, such as the "Novocrete" flue blocks we market ourselves, there is provided not only a sufficient outlet for gaseous products, but also sufficient extra area in the channels to allow a fair measure of ventilation; and whether the fire be in use or not the channel is always doing some ventilating work. The value of the ventilation thus provided is enhanced where an inlet is made to the flue shaft at ceiling level, because this is the place where the foulest air is to be found. We have designed a block for insertion in the flue at ceiling level for precisely this purpose; and its construction is such that in normal working the heat of the surplus gases is utilized to remove vitiated air from the top of the room, while should some local condition at any time result in a down-draught, the downward current is prevented from traversing the lower part of the shaft, and is thus discharged at ceiling level, where it can do the least harm.

"Novocrete" Flue Blocks.

These "Novocrete" flue blocks are rather interesting from several points of view; and a short description will, I think, not come amiss here. You are no doubt familiar with the fact that where a fireplace is installed in a room, the building regulations lay down that it must be provided with, at least, a 9 in. by 9 in. brick chimney flue. This entails building a chimney breast projecting from the inside surface of the wall; and if there be storeys above where rooms also have fireplaces, this breast must be wide enough to act as a foundation for all of them. This results in a large number of bricks being used, a considerable expense in labour, and a not inconsiderable reduction in the actual cubic capacity of all the rooms involved. The enormous spread of gas fire heating, particularly for bedrooms and the like, and the fact that a 9-in. square flue is unnecessarily large for the work of removing the surplus gases, have led to the invention of hollow blocks each the thickness of a brick—viz., 4½ in.—and wide enough to take the place of two bricks. In this way a block can be built as an integral part of a wall. Specially-shaped blocks are required to take the gas fire and allow room for its flue nozzle and others to incline the hollow flue away from its original centre-line in order that it may pass alongside the flue originating in the room on the storey above. Special terminal blocks are also required for use above the roof. There is one other detail as to size of "Novocrete" flue blocks which requires notice. I have not yet mentioned their height. This is because, owing to the differences in the dimensions of bricks in various parts of the country, "Novocrete" blocks have to be made in three different heights to enable all cases to be dealt with. Thus London bricks are 2¾ in., Scotch bricks 3¼ in., and other bricks 3 in. high. Allowing for four courses of London bricks with the requisite mortar bond makes the block 11¾ in. high, whereas three courses of the other bricks with bond are suited by blocks 10½ in. and 9¾ in. high respectively. So much for the sizes and shapes of blocks; but there is a special feature about "Novocrete" blocks which greatly increases their adaptability and convenience compared with anything of a similar nature. This is their composition, for they are made of a special form of light-weight concrete. Carriage charges are thus reduced by nearly one-half, and owing to the fibrous nature of the aggregate they are exceedingly tough and stand rough handling without damage. Another outstanding advantage is that they may be sawn through or cut, which greatly facilitates fitting, while they are not fractured by nails or spikes which may be driven into them to hold pictures or other fitments. Their non-conducting properties are such that decorations are not injured, and, as compared with brickwork, there is no disintegration of mortar and the like from the action of products of combustion.

Altogether you will have understood that in these "Novocrete" flue blocks we have a very useful means of economy in building costs, together with an arrangement entirely suitable for use with gas fires and for ensuring ventilation in bedrooms and any other apartments.

There are a number of other expedients that have been resorted to in fitting gas fires to new property. A common arrangement is to put a gas fire mantel across the corner of a room and to conduct the gases upwards by means of flue pipe ascending the corner between the walls. This works well provided, of course, that the flue pipe is taken far enough up to project through the roof, and is then fitted with a proper terminal. Care must be taken that the flue pipe is insulated from any contact with woodwork, and it is better from this and other points of view to use material like "Urastone" or "Asbestol" than iron for the piping. Superimposed rooms can be served in this way, and the two pipes laid side by side through the upper one. Such pipes, of course, do not provide anything approaching the amount of ventilation given by a "Novocrete" block.

Another arrangement I have seen—though I should not recommend it unless as a makeshift in place of something better—is a hole through the inside wall for the flue nozzle, and discharging into the cavity between inner and outer walls. The gases were then directed upwards by means of a channel formed by tiles or bricks laid in two parallel lines upwards between the two walls. A cast concrete flue terminal was provided on the roof and it had cast-iron gratings on each side and on the ends. The channel between the walls should extend below the point of entrance of the flue nozzle, otherwise this will soon become choked by falling mortar or brickwork as the gases begin to cause disintegration. It is obvious that a flue of this sort must be carefully finished at the brick joints inside, otherwise the area will be seriously restricted.

You will notice that I have throughout these remarks insisted on the flue terminal being led through the roof. This requirement is a *sine qua non* to successful operation of any form of flue whatever. I have seen a case where two parallel

flues from fires back to back in adjacent rooms discharged into a flue terminal above the roof, and trouble was experienced with down-draught. This was traced to the fact that the partition between the flues had been prolonged into the terminal. The end of each flue was thus in effect on the face of a wall—viz., the partition. Removal of the partition, giving freedom for a wind to blow right through the terminal, was required to put the down-blow right.

Since then I have seen a completed housing scheme embracing hundreds of dwellings in which two or more gas fires are installed in each. Every gas fire is attached to a flue built in the wall. Apparently to save costs, these flues were terminated in perforated blocks *below* the eaves. The result is disastrous. As soon as wind blows towards the perforated blocks, the whole of the spent gases, which should be discharged from each, are forced downwards into the room; and complaints are loud and continuous. Unfortunately the complaint is always made against the gas fire; and the cause of gas heating is endangered through no fault of our own. No doubt in many similar cases of this sort the occupant grins and bears it; but any future attempt to get him to use gas fires will probably be doomed to failure, and he becomes a source of private propaganda against gas heating. The only remedy against cases of this sort, in the absence of legislation, is to get early news of the initiation of housing schemes, and to attempt to influence the architect or builder. I have found several of them amenable to reason when the underlying principles have been explained to them. There is nothing mysterious about flues, but the trouble in getting some of them to work satisfactorily is due to the extreme difficulty of identifying and assessing the various factors that, combined together, account for the unsatisfactory results. Some three years ago I prepared and read a paper entitled "Flues to Gas Appliances." It had a considerable success at the time, and has since, in pamphlet form, been in such steady demand that we have had to reprint it. In this I discussed at some length the principles governing successful flue installations; and while the time at our disposal is insufficient to allow of such full treatment now, it seems to me that a short account is called for to make these remarks more complete.

Function of a Flue.

Briefly then, I must say, at the risk of repetition, that the function of a flue is twofold. The primary one is to remove the products of combustion and to convey them away in such a manner as to prevent their vitiating the air of the room. The secondary function is to ventilate the room. It must be clearly understood that the removal of the products is the first and chief object of a flue, and that the removal of ventilating air is a special function, and unless it is performed in such a way that the air is not actually drawn through the appliance, be it fire, oven, or boiler, it will be a positive disadvantage, owing to its cooling effect interfering with the efficiency of the appliance.

Apart from this requirement, it may be stated in general that the heat given off by burning gas is capable, in favourable circumstances, of imparting movement to comparatively enormous quantities of air, and that unless an appliance is in itself so efficient as to utilize practically all the heat of combustion, there is left in the products of combustion sufficient unutilized heat to do a considerable amount of extra air removal. Here is the snag however. Though this effect of heat is so considerable in volume of air removed, yet the actual force at work is small. For instance, it is calculated that the force required to maintain a flow of 10,000 c.ft. of air per hour up an ordinary chimney is about 2½ thousandths of a horse-power. It is therefore evident that the adverse forces necessary to overcome the flow are also of small magnitudes, and, to restrict it, proportionally smaller still. One effect of this is that with a given source of heat the more of it you utilize for removing air, the easier it is to upset the flow, for you reduce the mean temperature and you increase the cross-sectional area of the flue. This means that the flue has a larger superficial area of cooling surface, and that as the outlet gets larger each square unit of it has a smaller force behind it thrusting the column of air forth. Consequently, a smaller adverse force of wind, for instance, is required to stop flow than would be the case if all the upthrust were concentrated on an outlet area of smaller dimensions moving only a small volume of air at a higher temperature. This is one reason underlying the advice "Keep the flue warm." There is also another reason. If a flue becomes cooled sufficiently, it will condense water vapour from the products of combustion. This is an unmitigated nuisance, for if the flue be of impervious material the water runs down, and must be disposed of, whereas if it be porous, like brickwork, it may absorb the water. It may do this to such an extent that decorations may suffer on the room side, while simultaneously the flue may be rendered so cold and damp, where the source of heat is working only intermittently, that it can only be made to work again with difficulty. Further, if cooling and condensation proceed very far, the mixture of products and air is rendered actually heavier, bulk for bulk, than air itself; and cases have actually been known where an up-draught has been turned into a down-draught from this cause. This, however, is not a particularly common cause of down-draught, and it may be stated that infinitely the most important factor that has to be considered in all flue installations is wind. If once we can impart to those concerned the general action of wind on a flue, we shall have gone a long way towards preventing the recurrence of those problems we are discussing. This action may be due to two causes—either (1) what may be called dynamic pressure, or (2) to an actual movement of air across or down on to the end of a flue. The simplest illustration of the first is that of a house standing by itself without any protection. If the wind blows directly against one wall, there will obviously be a pressure against that wall. So long as the wall is unbroken, the air will be unable to proceed in its original direction, but it will always be ready to do so, were the obstruction removed. At the same time there will be a region of lower pressure at the side of the leeward wall. There is thus a slight pressure or plenum on the windward side, and a slight vacuum on the leeward side of the house. Under conditions of this sort, should an opening be made in the wall against which the pressure is exerted, the inevitable result is a flow of air away from the plenum and towards the vacuum. Thus if a flue pipe be thrust through the windward wall, air must flow through it into the house, and nothing can stop it but a superior pressure exerted on the internal end of the flue. No such contra-force exists, because the pressure or upthrust exerted by the hot gases is small compared with that exerted by even a gentle wind. You will therefore realize that no system of cowls or H pipes whatever is of any use in preventing down-draught in these circumstances so long as the terminal itself is on the face of the wall. On the other hand, a flue thrust through the leeward wall of the house will work perfectly, for its own upthrust will be helped by the slight partial vacuum at that place. As, however, houses cannot be turned to suit the changing wind, it is essential that the outlet of a flue pipe shall be extended upwards until it reaches a position outside the influence of the dynamic pressure. In the simple case we are considering, this means terminating the flue above the eaves of the house.

Two other comparatively simple cases may be also mentioned as examples of conditions which may be encountered. For instance, suppose a short building is on the windward side of a taller one. In this case there will clearly be pressure on the windward side of the smaller and suction on the leeward side of the taller building, but the distribution of pressure and suction in the space between the two is impossible to forecast, as it depends not only on the respective heights of the buildings, but also on their nearness, and on whether the shorter overlaps the taller laterally, or *vice versa*. In general one would expect not merely a dynamic pressure, but usually a distinct current of air, more or less violent according to the wind, down one wall and up the other. If the order of the buildings is reversed, the direction of the current might be expected to be the same, but the difference between the two cases would probably be in the *minus* or *plus* pressure in the space—viz., *plus* in the former and *minus* in the latter—compared with that of the extreme windward wall.

The interesting point arises, however, that, when there is a direct and distinct current of air downwards on to it, no ordinary unprotected flue can be expected to work satisfactorily whether it projects above the eaves or not. Thus were there a flue pipe taken up the left-hand or windward wall of the smaller building in the latter case, even were it taken well above the eaves, it would still be in the path of the downblow, and would require the protection of a cap of some sort to make it work. Even then it is possible to imagine it failing owing to a back-up of pressure caused by the downblow striking the roof below it.

It is hardly necessary to say that, contrasted with the very complicated arrangements of buildings, chimney stacks, and projections of all sorts that one comes up against in towns, the three instances given are comparatively simple to deal with, whereas in practice it is impossible to anticipate what will happen as the wind changes from one quarter to another. Still I have tried, and I hope succeeded to some extent, to give you an idea of the chief cause of our troubles—viz., the wind—and the chief remedy—viz., the extension of the flue well above the eaves. Most flue problems in new housing schemes can be solved by applying the principle given here; and it is only when we come to adapting old property to new appliances that the really difficult problems arise and every case is an individual one requiring to be treated on its merits.

Discussion.

Mr. J. W. Napier (Alloa) referred to the circumstance that the building industry was almost entirely engaged in erecting houses and building schemes of local authorities; and with this in view it did appear that the dereliction of duty in providing efficient chimney flues lay almost entirely with the Scottish Board of Health and town councils, and with private enterprise only to a small extent. Architects also were not blameless. It was extraordinary that throughout Scotland hundreds of houses already erected and at present under erection were fitted with gas fires with flue arrangements which constituted a positive danger to the occupants. At the same time, serious harm was being done to gas as a fuel. The explanation given was unfortunate, but true. It was that reduced costs of building were being searched for, and that the Scottish Board of Health had so far officially declined to alter their plans to meet the wishes of

gas undertakings, because of expense. This was also the case with many town councils. They were impressed with the view that gas fires did not need ordinary coal-fire chimney ventilation. This state of affairs should not be allowed to continue, and strong representation on behalf of gas authorities must be made officially in the first place to the housing officials of the Scottish Board of Health.

Mr. A. P. MAIN spoke from the gas appliance maker's point of view, and explained how necessary it was that the gas undertakings themselves should make the move.

Mr. FORSHAW said that he had approached the Scottish Board of Health, and had learned that they had no powers to do anything. The matter lay with the town councils and the Dean of Guild Courts. In England the same thing applied to the Ministry of Health. It was essential that fresh legislation be introduced, or present provisions altered.

Mr. FARQUHAR, in concluding the proceedings, said he was impressed with the interest taken in the subject by Mr. Napier. He thought that all those present would appreciate the position of the manufacturers. He emphasized the need for a strong stand to be made in the matter of building "flueless rooms."

A hearty vote of thanks was then accorded Mr. Forshaw.

Eastern Counties Gas Managers' Association.—The half-yearly meeting of the Association will be held at Bedford on Wednesday, May 16, under the Presidency of Mr. J. B. Hansford, who will deliver his address in the afternoon at the Shire Hall. The morning will be devoted to an inspection of the gas-works, and the display of a cinema film illustrating the construction and working of the Glover-West vertical retorts. Members will be entertained at luncheon in the Town Hall by the Chairman and Directors of the Bedford District Gas Company. In the evening members and their wives will dine together in the Town Hall, after which they are invited by the President and Mrs. Hansford to a reception and dance at the Corn Exchange. On the following day there will be a visit to the Royal Airship Factory at Cardington, and then to Luton, to inspect the works of the Davis Gas Stove Company, Ltd., where they will be entertained at luncheon by Mr. Harold N. Davis and Mr. Cyril G. Davis (Managing Directors).

Southern Association of Gas Engineers and Managers.—The arrangements for the visit of the Association to Rochester on Friday, May 18, are now complete. Members will assemble at the Rochester, Chatham, and Gillingham Gas Company's Rochester Works at 10.30, when an inspection will be made under the guidance of the President (Mr. C. Valon Bennett) and his staff. At noon, motor coaches will convey the visitors to the Town Hall, Chatham, where they will be the guests of the Chairman and Directors of the Company at luncheon. Afterwards a visit will be paid to H.M. Dockyard, Chatham. At 4.30 motors will leave the Dockyard for the Company's new showrooms in High Street, Chatham, where tea will be served.

Forthcoming Visit of Belgian Journalists.—On Thursday, May 10, a party of some forty managers and journalists, representing all the leading Belgian papers, headed by M. Reynders, President de l'Association des Directeurs de Journaux, and accompanied by M. Heyman, Ministre de l'Industrie et du Travail, are visiting the Gas Light and Coke Company's leading West-End showroom, their chief offices (the birthplace of the first, and still the largest, Gas Company in the world), and their works at Beckton. They will be entertained, along with a number of their English confrères, by the Imperial Continental Gas Association to luncheon at the Savoy Hotel and to tea by the Gas Light and Coke Company at their Sports Ground at East Ham.

Pitman's Technical Dictionary.—The first number of a Technical Dictionary of engineering and industrial science (including gas engineering) in seven languages—English, French, Spanish, Italian, Portuguese, Russian, and German—compiled by Ernest Slater, has been published by Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C. 2. The Dictionary will be complete in about 36 fortnightly parts, and each part costs 2s. 6d. net. Prior to the start of the Dictionary proper there are sections dealing with the art of technical translation; alternatives, refractory idioms, and peculiar phrases; adopted words; mechanical motion, relation, position, cause and effect; and common engineering abbreviations. The Dictionary should prove of very great value.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Electrical Fusion of Gas Pipes.

SIR,—I have read with much pleasure Mr. H. C. Widlake's interesting brochure on the "Electrical Fusion of Gas Pipes," and can amplify his instances by cases taken from my own district—one at least attended by fatal results and others missing disaster by the merest good luck.

There is, however, one point on which I would like a little further information—whether it is actual contact between a live electrical wire or casing and a live gas pipe which produces an arc and consequent perforation, or break of contact allowing the arc to form across the intervening space.

Writing as one entirely ignorant of electrical matters, I am inclined to believe the latter is really what happens, and I have confirmed the same experimentally before my plumbers, in order to give them a practical demonstration of the wisdom of keeping electric wires and gas pipes as far apart as possible. I had rigged up a defective electric wire in a steel casing, the latter being in contact with live compo gas pipe. Nothing happened till contact was broken, even by the merest fraction of an inch, when the arc instantly formed, perforated the compo, and ignited the issuing stream of gas. This was one of the most telling demonstrations which plumbers could expect to meet.

It was this break of contact, I believe, which caused the fatal accident mentioned above, the details of which were so out of the ordinary that they were reported at the time in the "GAS JOURNAL."

There is another danger which should be guarded against when laying electric wires or casings, a danger which was very forcibly brought to my knowledge only recently. We received a report of a gas escape which had caused a small fire beneath the flooring boards of a bedroom and close to a heating stove. An examination showed that, while electric casings and compo pipes were clear from each other, the electric casing had been laid alongside and in contact with old bare copper bell-pull wires long since out of use and neglected. In one part of its course the compo pipe passed under these old wires, but whether the pipe was in contact with them or not is not quite clear. What is clear is that by some means the old bell wires had become electrically alive, had perforated the compo tube, and started the fire. Fortunately the accident happened at 10.0 a.m., instead of in the small hours round about midnight. Without waiting for any permission from the proprietor, I at once instructed my inspector to rip up the necessary flooring boards and cut away all the bell wires he could get hold of—a proceeding for which the proprietor afterwards gave us thanks.

The vagaries of stray electric currents are very various, as we found one day when a report came in from the manager of a restaurant that he could not turn his meter off, because the handle of the tap was too hot! This seemed interesting enough to demand personal investigation. On reaching the restaurant, I found the facts as stated above; the meter tap being too hot to be handled except by means of a wet cloth. Where the defect was, I could not say, but I told the manager he must at once shut off his electric supply. This, he protested with great volubility (he was an Italian), he could not do, for his place was then full of guests. Then he must shut down his gas supply; but this also was impossible.

As our argument threatened to become as hot as the meter tap, I had at length to present him with a two minutes' ultimatum: Either he would shut off his electric supply, or I would cut off his gas supply. Eventually he sent for those true friends of an electric consumer, empty bottles and candles, and so saved the incident from becoming an international one.

Unfortunately I was never able to ascertain what caused the meter and tap to attain such a feverish temperature, though I have little doubt that the proprietor's premises narrowly escaped a serious accident.

PLUS-MINUS.

April 19, 1928.

Sun or Moon for Workers?

SIR,—Much public attention is now being directed to the highly successful demonstration in the pithead clinic at the Sherwood Colliery, Mansfield, of artificial sunlight baths for miners. This very practical step towards fostering the right spirit in industry has aroused the sympathetic interest of men as different as the Duke of York and Mr. Cook.

An experience, which has just been brought to my notice, of the industrial value above-ground of complete real sunlight is therefore interesting at the moment. Last March Messrs. Ferranti's equipped a large extension of their electrical and general engineering works at Hollinwood, Lancashire, with 33,000 sq. ft. of "Vitaglass," admitting the ultra-violet as well as all the other rays of the sun direct to the workers at their benches; and they have now had an opportunity of noting the effects.

The particular shop is declared to be notably brighter and warmer, and its occupants are manifestly content and happy. In short, it has been found that the experiment gives all the advantages of sunlight indoors.

Who will put a limit to the results in a generation's time of these efforts to bring the real sun to workers within its reach, and to create artificial sunlight for those who toil where windows are not? A worker who is given the sun will not cry for the moon.

C. W. SALEEBY, M.D., F.Z.S., F.R.S.E.

13, *Greville Place, N.W.* 6,
April 28, 1928.

REGISTER OF PATENTS.

Low-Temperature Carbonization.—Nos. 287,584-7.

LOW-TEMPERATURE CARBONISATION, LTD., of London Wall Buildings, E.C. 2, and PARKER, C. H., of Codsall.

No. 23,706; Sept. 25, 1926.

The first of this series of patents relates to the two-stage process of low and medium temperature distillation, and deals with the shape of the actual chambers within a vertical retort in which a number of chambers are formed in a single casting.

The invention has among its objects to provide a retort of such a form in which the area of the external walls to which heat is applied is extensive, and in which heat is applied to the charges from each side of the retort cavities or chambers formed therein, so that the transmission of heat is rapidly effected from the opposite sides and ends to the centre part of the charge.

No. 23,707: Sept. 25, 1926.

According to this invention, which again relates to a two-stage process, water is passed into the second retort or receptacle, or into the discharging chamber into which the hot residue of the distillation of coal may be passed, for the purpose of quenching, so that the latter is effected in an atmosphere of steam at a slight pressure.

No. 23,709; Sept. 25, 1926.

This invention is for a form of apparatus suitable for low and medium temperature carbonization. Among its objects are "to avoid the practical difficulty hitherto experienced in so-called low-temperature distillation, and to provide an apparatus that is relatively inexpensive and in which the charging and discharging are simply and expeditiously performed as well as the cooling or quenching of the residue of distillation, and wherein the rate of progress through the retort is readily determinable and variable according to the character of the raw material and the character of the desired carbonized product."

The specification extends to thirteen pages; there are fourteen claims; and five sheets of drawings. The broad lines of the invention are indicated in the first claim, which is as follows: Apparatus for the distillation of coal and similar carbonaceous substances, wherein the substance to be distilled is charged into receptacles which are caused to pass through a retort by rolling upon straight inclined tracks from the charging to the discharging positions, and wherein means are provided to seal the retort at the charging and discharging positions and at the same time to effect the periodic charging of the retort with one or more receptacles, and the periodic discharging from the retort of one or more receptacles so that there is a continued progression of the receptacles through the retort, substantially as described.

The other claims cover the many other features which are described in detail.

No. 23,710; Sept. 25, 1926.

The patentees claim, for apparatus in which the carbonaceous substance is charged into receptacles of cylindrical or elongated form, and the receptacles are caused to roll through an inclined retort furnace, the step of causing the receptacles to traverse a chamber or chambers through which hot waste gases pass; the object being the drying of the material prior to carbonization.

A form of apparatus is also described and covered in a claim.

Gas Meters.—No. 287,650.

WILSON, F. C., of Coventry.

No. 89; Jan. 3, 1927.

This invention refers to gas meters of the kind in which the whole of the mechanism is surrounded by the gas within the meter casing, into and from which it can be inserted and withdrawn intact as one unit. More particularly, the invention relates to the type of such meter in which the measuring chambers each consist of a metallic casing or drum containing a movable diaphragm. In a previous construction of meter of this type the valve seats are separately and detachably mounted on a plate or valve gallery, and communicate with independent distributing channels arranged at the opposite side of said plate and connected by union joints with their respective measuring chambers. The valves themselves are arranged to be moved in directions parallel with each other from a shaft disposed horizontally.

According to the present invention, a more compact arrangement and less expensive construction of the valve mechanism is obtained by forming the valve plate in two superposed parts, one of which carries the valve grids permanently associated therewith, while the other is in the form of a box casting cored internally to form separate compartments open respectively to one or more of the grid ports in the first part and to the exhaust pipe, and carries connections for establishing detachable communication between said compartments and their respective measuring chambers.

Alternatively, the cored casting may carry the valve grids inseparably combined therewith, while the other part may form a base therefor and carry the connections for establishing communication with the measuring chambers.

Low-Temperature Carbonization.—No. 287,830.

LOW TEMPERATURE CARBONISATION, LTD., of London Wall Buildings, E.C. 2, and PARKER, C. H., of Codsall.

No. 23,708; Sept. 25, 1926.

According to this invention, which relates to a two-stage process of low or medium temperature carbonization, in addition to the means provided at the upper end of the first or upper retort whereby the gas evolved may be withdrawn, means are also provided whereby gas evolved may be withdrawn from the vicinity of the junction between the upper retort or the like and the lower retort or chamber or the like. The gas thus withdrawn by the means adjacent the lower part of the first retort is conducted upwards by an auxiliary ascension pipe and delivered to the main ascension pipe leading from the upper part of the retort at a point behind the anti-dip valve by which the retort is protected and isolated during the discharge. The tar which condenses in the auxiliary ascension pipe is allowed to fall into an additional tar main in which the end of the auxiliary ascension pipe is sealed. The tar is advantageously allowed to pass away from the additional tar main over a dam which thus ensures the maintenance of a constant level in the main.

Purification.—No. 273,250.

HUMPHREYS & GLASGOW, LTD, of Victoria Street, S.W. 1.

(Assignees of W. H. Fulweiler, and C. W. Jordan, both of Delaware.)

No. 8376; March 26, 1927. Convention date: June 24, 1926.

Impurities, more particularly hydrogen sulphide, are removed from illuminating and like gas by scrubbing it with an alkaline solution of sodium carbonate or salt. The solution thus fouled is revivified by passing subdivided air through the solution. A fouled solution, such as referred to, in contradistinction to a sludge, is obtained in processes where the gas is scrubbed with a solution of sodium carbonate containing a catalyst, of which a relatively small quantity of soluble iron salt in a form not precipitable by hydrogen sulphide is an example; and the object of the present invention is to effect an improvement in the revivifying of such a solution.

The improvement consists in introducing air in a coarsely divided state entirely beneath a rapidly moving paddle immersed in the foul solution, and adapted to divide finely and pass the introduced air through the solution; foaming-off of sulphur as it is set free being controlled by varying the quantity of coarsely divided air introduced, and the setting free of the sulphur as such being controlled by changing the speed of rotation of the paddle, and, it may be, its depth of immersion in the solution.

A form of the paddle and "spumer" is illustrated and claimed.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 25.]

AUTER, J. P.—"Gas burners." No. 11,824.
BARRETT COMPANY.—"Distillation of tar." No. 11,775.
BECKER, E. W.—"Gasification of fuels." No. 11,714.
BROADHEAD CONSTRUCTIONS, LTD.—"Means for drying gas." No. 11,744.
BROADHEAD, R. W.—See Broadhead Constructions, Ltd. No. 11,744
CHAMBER OVENS, LTD.—"Gas producer furnaces." No. 11,505.
CONNERSVILLE BLOWER COMPANY.—"Gas meters." No. 11,818.
DOCKING, A.—"Supply of gas and air mixture to gas burners." No. 11,536.
FLY, G.—"Liquid or gas taps." No. 11,514.
GILES, A. L.—See Fly, G. No. 11,514.
GRAF, K.—"Devices for testing gas pipes for leakage." No. 11,457.
RITCHIE, HART, & Co., LTD.—See Docking, A. No. 11,536.

LEGAL INTELLIGENCE.

DAMAGE FROM A GAS EXPLOSION.

Question of Liability.

An interesting case of tenant *v.* landlord came before Mr. Justice Salter and Mr. Justice Talbot in the King's Bench Divisional Court. The plaintiff, Mrs. Elizabeth Brooke, appealed against a judgment given by Judge Toblin in favour of her landlord, Mr. John Bool, in an action by her for damages to goods occasioned by a gas explosion. The appeal was allowed.

Mrs. Brooke was the tenant of a shop and basement in Warwick Square, W. It had been agreed that Mr. Bool, who occupied the upper portion of the premises, should have the right of visiting the shop at night to see that everything was secure. During the night of May 3, 1927, Mr. Morris, who was a lodger of the landlord, complained of a smell of escaping gas, and both he and Mr. Bool went into the shop to discover whether any gas was in fact escaping. Mr. Bool struck a match and lit a burner at the bottom of a gas-pipe which ran down one of the walls of the shop, but found no leakage there. Mr. Morris then got up on to the counter to examine the upper part of the pipe, and struck some matches. An explosion occurred, resulting in personal injuries to Mr. Morris and damage to the premises and the plaintiff's goods which were stored there.

Mrs. Brooke brought an action against her landlord, alleging that the accident was due to negligence on his part, and claiming damages for injury to her property and business; but Judge Toblin, as stated, found in favour of Mr. Bool.

Mr. Justice Salter came to the conclusion that the actions of Morris implied instructions from Bool, who was really responsible. Moreover, Mrs. Brooke was entitled to succeed on the ground of joint enterprise between Bool and Morris.

Mr. Justice Talbot agreed.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Barnet District Gas and Water Bill: Returned from the Commons, with the amendments, agreed to.

London County Council (General Powers), and Middlesex and Surrey (Thames Bridges) Bills: Brought from the Commons, read the first time, and referred to the Examiners.

Llandudno Urban District Council and South Metropolitan Gas Bills: Read a second time, and committed.

York Town and Blackwater Gas and Electricity Bill: Committed.

Mablethorpe and Sutton Gas Order: Referred to the Special Orders Committee.

Royal Assent.

The Barnet District Gas and Water Bill received the Royal Assent on April 26.

HOUSE OF COMMONS.

Progress of Bills.

Barnet District Gas and Water Bill: Lords amendments considered, and agreed to.

Middlesex and Surrey (Thames Bridges, &c.) Bill: Read the third time, and passed.

Mablethorpe and Sutton Gas Order: Copy presented.

Scientific Treatment of Coal.

Mr. Shinwell (on April 24) asked the Secretary for Mines the terms of the contract arranged with the Gas Light and Coke Company in respect of scientific treatment of coal.

Commodore King replied that the necessary plant for a three years' trial on a commercial scale was being erected at Richmond, on a site provided by the Gas Light and Coke Company, by a Company formed for the purpose, known as the Fuel Production Company. The latter Company had received a guarantee under the Trade Facilities Act in respect of a loan of £100,000. The Gas Light and Coke Company acted as managers for the Fuel Company and bore all the running expenses, and had an option to purchase the plant at the end of three years. Steps had been taken to safeguard the public interest in any patents that might be taken out as a result of this experiment, and full details of the plant and of the results obtained would be made available.

Mr. Shinwell: Can the Minister say why it is that when public money is involved, and it is proposed to render assistance to this private Company, they should have the option of purchasing the plant outright at the end of three years? Is it not desirable to retain the plant in the hands of the Government?

Commodore King: No, Sir, it is not Government money; it is money guaranteed under the Trade Facilities Act.

Mr. Shinwell: But can the Minister say whether it is not true that Government servants, technicians, and others, are to render service to the Gas Light and Coke Company in connection with the installation of this plant and its maintenance.

Commodore King: I should like to have notice of that question, but, of course, the Fuel Research Board are taking a keen interest in this experiment.

Mr. Shinwell: Can we have from the Minister a statement as to when there will be an opportunity afforded to this House to discuss this important matter?

Bergius System.

On April 25, Mr. Hardie asked the Secretary of Mines what progress had been made with the experiments on the Bergius system of coal treatment.

Commodore King stated that steady progress was being made at the Fuel Research Station with experiments on the Bergius process along the lines previously mentioned by the President of the Board of Education. The work being done was of a fundamental nature, and was not being carried out from the point of view of immediate commercial application. The results of the investigations would be published in due course.

MISCELLANEOUS NEWS.

LONDON GAS LEGISLATION.

County Council and Companies Agree.

The circumstances in which it has been decided not to petition against the Bills which are this year being promoted in Parliament by the South Metropolitan Gas Company and the South Suburban Gas Company are explained in the following report of the Parliamentary Committee to the London County Council.

South Metropolitan Gas Bill.

We reported on Jan. 24 with regard to the provisions of the South Metropolitan Gas Bill, and the Council on that date gave authority for a petition to be deposited, if necessary, against the Bill. The Bill sought to extend the limits of supply of the Company and to authorize the Company to raise further capital not exceeding £1,000,000 by the issue of additional ordinary or preference stock, to borrow on mortgage up to one-half of the additional capital actually raised at the time of such borrowing, and also to borrow up to one-half of the total capital raised by the issue of ordinary or preference stocks up to the date of the passing of the Act. It was pointed out to the promoters that the amount which would thus be available for capital expenditure, including the sum of £887,500 authorized capital of the Company not yet raised, would be over £3,313,000, which it was suggested was excessive. As the result it was agreed that the Bill should be amended so as to limit the total new borrowing powers proposed in the Bill to a definite sum of £1,000,000. The Bill contained a provision that the Company might apply to any purposes of any Act of the Company any moneys which they were authorized to raise by the Acts of 1916, 1918, 1921, or the intended Act. It was suggested that the purposes to which capital might be applied should be limited strictly to the purposes to which capital was properly applicable; and the Company agreed to amend the Bill accordingly. A further point which concerned the Council was the proposed reduction of the period of notice to the Council and others of the offer to the Company's consumers, employees, or stockholders, or of the sale by auction, of stock or debenture stock from a minimum of 28 days to a minimum of 7 days. As the result of negotiations, the Company agreed to substitute a period of 14 days' notice for the period of 7 days specified in the Bill. In view of the agreement arrived at on these points, it was not necessary to petition against the Bill.

South Suburban Gas (Consolidation) Bill.

We reported on Jan. 24 with regard to the South Suburban Gas (Consolidation) Bill; and the Council on that date gave authority for a petition to be deposited, if necessary, against the Bill. The Bill, in addition to consolidating, with amendments, previous Acts and Orders of the Company, sought to relieve the Company from the sliding-scale provisions of its Act of 1906 and from the provisions of the Gas Regulation Act, 1920, except those relating to the quality and testing of gas, forfeiture, penalties, testing of meters, accounts and returns, and contributions towards the remuneration and expenses of the Chief Gas Examiner and the Gas Referees. It was proposed that in future the price of gas supplied by the Company and the dividends to be distributed should be regulated by a scheme set out in the Bill similar to schemes applied to the South Metropolitan Gas Company by the South Metropolitan Gas Act, 1920, and to the Commercial Gas Company by its Act of 1927. Under this scheme the Company would be entitled to pay dividends on its ordinary stock at the minimum rate of 5¾ p.ct. per annum (called "the basic rate"), whatever the price charged for gas, and when the total revenue from the sale of gas in any year or half-year was less than the revenue which would have been received if the amount of gas sold in the year or half-year had been charged for at 11·5d. per therm (called "the basic price"), the difference would be called "the consumer's share," and for the purpose of the division of profits an amount, called "the surplus profits," would be calculated, being a sum of which the consumer's share was three-quarters. If and so far as the balance standing to the credit of the net revenue account permitted, a sum not exceeding one-eighth of "the surplus profits" might be applied in additional dividends to the ordinary stockholders, and one-eighth might be applied for the benefit of the employee co-partners.

The provisions of the Company's Act of 1918 relating to the sale of new stock by auction or tender were reproduced in the Bill with certain modifications, including the omission of reference to debenture stock and the reduction from 28 days to 7 days of the period of notice to be given to local authorities of the intention to offer or sell stock. Moreover, the clause as worded in the Bill did not require notice to be given to the Council. Authority was also sought for the payment of commission not exceeding 5 p.ct. on issues of ordinary or preference stock, subject to the approval of the Board of Trade. The Bill also contained a number of miscellaneous provisions, including provisions to authorize the erection of gas-works and other buildings, and to enable the Company to lay down and maintain mains, pipes, and culverts for the purpose of procuring, conducting, or disposing of any oil or other materials used by it in, or resulting from, the manufacture of gas or any residual products, and to apply the provisions of the Gas-Works Clauses Act, 1847, with respect to the breaking up of streets to the purposes of the proposed new power.

The basic price of 11·5d. per therm in the scheme for regulating the price of gas and dividends compared with 11d. in the similar schemes authorized by the South Metropolitan Gas Act, 1920, and the Commercial Gas Act, 1927. As the result of negotiations the Company agreed to substitute a basic price of 11d. per therm for that of 11·5d. per therm. The Company also undertook to insert a clause for the protection of the Council's sewers, and a provision applying the London Building Acts to buildings and works to be authorized under the Bill, to withdraw from the Bill the provision referred to above as to the laying of pipes for ancillary purposes, to include debenture stock in the clause dealing with the sale of new stock by auction or tender, to substitute 14 days' notice of intention to offer or sell stock for 7 days, to provide for such notice to be given to the Council, and to amend the clause relating to the payment of commission on sale of capital so as to allow the maximum commission to be such amount not exceeding 5 p.ct. as the Board of Trade might allow. It was consequently not necessary to petition against the Bill.

The Birmingham Board of Guardians have faith in the apprenticeship system. At their last meeting, a boy from one of the Poor Law Institutions was placed in employment with the Birmingham Gas Department, to learn the trade of a gasfitter.

BOMBAY GAS COMPANY, LIMITED.

ORDINARY GENERAL MEETING.

The Ordinary General Meeting of the Company was held at the London Offices, Moorgate Street Chambers, E.C., on Wednesday, April 25—Mr. WILLIAM GRAHAM BRADSHAW, C.B.E. (the Chairman), presiding.

The SECRETARY (Mr. A. Dickson) read the notice convening the meeting and the report of the Auditors; and the Directors' report and the statement of accounts for the year ended Dec. 31 were taken as read.

CHAIRMAN'S ADDRESS.

The CHAIRMAN: Gentlemen,—Although during the past year there was not any striking advance in the general conditions of Indian trade, the figures of all-India trade for the ten months April, 1927, to January, 1928, indicate a slight improvement over those of the corresponding period of the previous year. The total value of exports of private merchandise from British India was greater by 7·6 p.ct. and the value of imports was more by 8·7 p.ct. The monsoon was satisfactory, and crops were mainly good. The volume of trade through the Port of Bombay, both import and export, showed an improvement during the year, the increased tonnage being 321,576 for imports, and 375,400 for exports.

Although in these respects circumstances appeared to be favourable, the cotton industry, on which the trade and prosperity of Bombay so largely depends, continued—and I am afraid I must say continues—to remain in a depressed state; the sale of cotton goods declining in both quantity and value, owing to the largely increased imports of Japanese cloth. However, stocks have risen, and the prices obtained have left no margin of profit. Notwithstanding these somewhat adverse conditions, the Company's business continued to progress satisfactorily.

MORE GAS SOLD.

The total quantity of gas sold was 452,758,000 c.ft., being an increase of 23,869,000 c.ft., or 5·6 p.ct., over the previous year. An encouraging feature in regard to this increase is that, notwithstanding the keen competition with electric lighting, the Company continued to receive a satisfactory share of the extension of the public lighting; the additional quantity of gas supplied for this purpose being 12,661,000 c.ft., or an increase of 7 p.ct., compared with 3·9 p.ct. in the previous year. The increase in the sale of gas for heating purposes was 17,690,000 c.ft., or 9·2 p.ct.; but for private lighting there was a decrease of 4,030,000 c.ft., or 7·3 p.ct. The total expenditure for the year on capital account was £7520. The expenditure on new mains was £2480, which has provided some 4 miles of additional mains. A sum of £787 was expended in the provision of new cooking stoves; the facilities offered by the Company under the new hire system being rapidly taken advantage of by the consumers. During the latter part of the year the demand was such that we finished the year with no stock at all, and cable requests were received from the General Manager for immediate further shipments. The sale of fittings and appliances through the medium of our new showroom increased considerably over the previous year—nearly 1600 additional pieces of heating apparatus, including cookers and geysers, having been supplied.

WORKS EXTENSIONS.

Good progress was made with the additions to the works plant, mention of which was made at the last general meeting. The washing plant has been entirely re-organized and re-arranged, and three new machines have been installed. The cost of the new work (£4253) is included in the capital expenditure for the year. The Company's contractors are making satisfactory progress with the erection of the new gasholder, of a capacity of 1½ million c.ft. The work of excavating for the tank was commenced early in the year, and some 12,000 tons of material had to be removed. The erection was commenced at the close of the monsoon in September; and by the end of the year the holder tank was completed, and progress made with the erection of the bottom lift. In the absence of any unforeseen occurrence, it is expected that the contractors will have completed their work about the end of next month. The cost of this new holder so far as incurred is partly provided for by the amount standing at credit of the renewal fund, which was built up expressly in anticipation of the renewal of one of the original holders, which had been in contemplation for some time past. We found that the present-day cost of reconstructing this old holder and increasing its capacity by an additional lift was so great that it was more economical to include its capacity in the new and larger holder. The balance of the expenditure on the new holder has been carried to suspense account pending completion. Accounting for these items, the capital per million c.ft. of gas sold is only £828, which you will recognize is a considerable decrease upon what it used to be, and, I think, is not an unsatisfactory figure for a Company of this character.

THE ACCOUNTS.

Turning to the revenue account, there is a satisfactory improvement of £4057 in the receipts from gas. Public lighting increased by £1448, and private gas rental was more by £2609. The revenue from the sale of residual products was less by £968. The receipts from coke and breeze were less by £2289; the average price having further fallen from £1 14s. 3·8d. to £1 12s. 1·8d. per ton. On the other hand, there has been an improvement in tar, the receipts for which increased by £1321; the price per gallon being 7·3d., compared with 5·04d. in 1926. On the other side of the revenue account, the total expenditure was more by £4861. Coals cost £294 more; the quantity carbonized being 1428 tons more. The cost per ton of coal carbonized was 33s. 10·5d., a saving of 1s. 6d. per ton compared with the previous year. The quantity of coal used was 29,785 tons, and the sale of gas per ton of coal carbonized amounted to 14,054 c.ft.—a very satisfactory figure, but not quite so good as in 1926, when it was just over 15,000 c.ft. per ton. The net cost of coal, after deducting receipts from residuals, was 11·3d. per 1000 c.ft., being practically the same as in 1926. A further saving of £1233 has been effected in carbonizing wages, resulting from a full year's working of the new charging machine, coal conveyors, and coke handling plant. The cost of wages in 1925, when the retorts were all charged by hand labour, was £6774. It is now reduced to £4649, so that the full saving in cost of labour is a little more than £2000 per annum. That is a higher figure than we anticipated when we put in this machinery. Some £673 more was expended on repair and maintenance of works. Distribution charges are more by £3031; the increase being due to the overhauling and repairing of mains in connection with the re-making of roadways with heavily concreted surfaces which is now being carried out extensively by the Bombay Municipality. The cost of lighting and repairing public lamps was £466 more; there being 263 additional lamps in use. Rents, rates, and taxes are more by £358. Other items are about the same, and do not call for special attention. Summarizing these results, the total receipts are more by £3326, and the expenditure is more by £4861, the profit on the year's trading being consequently less by £1535.

RESULT OF THE YEAR'S WORK.

In the net result of the year's work, the balance of profit carried to the net revenue account is £20,165. There is a profit on exchange of £4603, which is £520 less than in 1926, owing to smaller remittances. The average rate of exchange was practically the same as in 1926, at 1s. 5·05d. per rupee. Adding this, and deducting the small debit balance of interest, there is a net profit of £24,765. The undivided profit brought forward from the previous year of £40,805 brings the total available profit up to £65,570. Deducting from this the interim dividend of £12,000 paid in November last and the customary additions to the reserve and insurance funds, which together amount to £1050, there remains £51,620, out of which a final dividend of 4 p.ct. is recommended (making 8 p.ct. for the year), leaving £39,620 to be carried forward to the current year, which is only £1184 less than was brought in.

THE OUTLOOK.

With regard to the future, the General Manager writes that, although trading conditions generally are still not satisfactory, there is a slight improvement over last year. There is a little more activity in the shipping trade, and decidedly more building in progress all over the island. A considerable number of roads have been laid down, the majority of which are of benefit to the Company, and will undoubtedly be more so as time goes on. He expresses confidence that we shall be able to show an increase of business, as in consequence of the development of our new showroom, combined with the personal efforts of our district staff, orders for heating appliances are now being extensively placed. A new coal contract has been arranged which will enable us to obtain our supplies at cheaper rates than previously; and this we hope will more than compensate for the falling market in residuals. During the year we had the advantage of frequent conferences with Mr. Lane (our General Manager and Engineer), who was home on furlough; and we have been able to discuss with him plans for extending the Company's business and cheapening the supply of gas. Mr. Lane takes an optimistic view of the prospects of the Company; and given cheaper coals and better trade conditions, he has no doubt that the Company will be able not only to maintain, but to improve its position. In this opinion the Directors have every reason to concur. In closing these remarks, I must pay a tribute to the zeal and ability which Mr. Lane brings to bear upon the Company's affairs. He never spares himself; and he inspires those who work under him with his own spirit of enthusiasm. In consequence the work is well done, and willingly done; and we have good cause to believe that the works are kept in a high state of efficiency. Mr. Lane, in his annual report to the Board, states that when the new holder is completed and put into operation the works will be exceedingly well laid and equipped, and will stand comparison with some of the best examples in Europe of a similar capacity.

Of the Company's employees in India, he says that it would be difficult to find a more efficient or keener staff than those engaged in carrying on the Company's business; and he speaks highly of the way in which the workmen do their work. No labour troubles were experienced during the year. When I have added that the small London staff perform their responsible duties to the entire satisfaction of the Board and with admirable ability and zeal, I need say no more to assure you that your interests are well cared for, and the continued prosperity of the Company is safeguarded, so far as human effort can secure it.

It is now my duty to move:

"That the report of the Directors and the statement of accounts for the year ended Dec. 31, 1927, now submitted, be, and the same are hereby, received and adopted."

The DEPUTY-CHAIRMAN (Mr. H. H. Macleod) formally seconded the resolution, which was carried unanimously without discussion.

THE FINAL DIVIDEND.

Proposed by the CHAIRMAN, and seconded by Mr. STANLEY H JONES, M.Inst.C.E., it was agreed:

"That a final dividend for the year ended Dec. 31, 1927, of 4 p.ct. (less income-tax at the rate of 2s. in the pound) be now declared payable on and after the 1st of May, 1928, making with the interim dividend of 4 p.ct. a dividend of 8 p.ct. for the year."

RE-ELECTIONS.

The CHAIRMAN said it was now his pleasure to move that the retiring

Directors (Mr. Hugh Henderson Macleod and Mr. Arthur Matthews Paddon, M.Inst.C.E.), being eligible and offering themselves for re-election, be re-elected accordingly. In doing so, he congratulated the proprietors upon the fact that these two gentlemen did offer themselves for re-election, for he could not imagine anyone better qualified than they to manage successfully an undertaking such as the Bombay Gas Company. Mr. Macleod possessed wide experience and knowledge of India, and especially of the Indian coal trade; and he brought the highest business ability to bear upon the affairs of the Company. Mr. Paddon was known throughout the gas industry, and had also made a name for himself in the legal profession; while, in addition to this, he commenced his career as an engineer in India, so that he had qualifications which they could not obtain anywhere else.

Mr. Jones seconded the proposition, which was unanimously agreed to.

On the motion of Mr. Bertram Ellis, seconded by Mr. H. F. Hills, the Auditors (Messrs. Spencer Gore-Browne and Mr. Alfred Morland, F.C.A.) were re-appointed.

Vote of Thanks.

Mr. Aschwanden proposed a hearty vote of thanks to the Chairman and Directors, to Mr. Lane (the Engineer and Manager) and his staff in Bombay, and to Mr. Dickson and his staff in London. The accounts, he said, afforded the clearest proof of the great amount of attention that was given to the affairs of the Company, both by the members of the Board and by the officials, all of whom deserved the highest commendation of the proprietors.

The resolution having been carried with acclamation,

The Chairman returned thanks on behalf of himself and his colleagues on the Board; remarking that it was a gratification to them to know that the shareholders were satisfied with the year's working.

The Secretary also acknowledged the vote on behalf of Mr. Lane, himself, and the staffs and employees in Bombay and London. He said they had passed through another year of somewhat depressed conditions; but it was very gratifying to the officials to find that, in spite of this, the results attained had somewhat exceeded the expectations entertained during the earlier part of the year.

THE INSTITUTION OF GAS ENGINEERS' EXAMINATIONS.

The following questions were set in the examinations in Gas Engineering and Gas Supply which were held on April 28 under the Education Scheme of The Institution of Gas Engineers. The Examiners were, for Gas Engineering, Messrs. H. D. Madden, M.Inst.C.E., M.I.Mech.E. (Cardiff), W. J. Smith, B.Sc. (Bolton), H. C. Smith, Assoc.M.Inst.C.E. (Tottenham), John Terrace, M.Inst.C.E. (London), J. Stanley Thorman (London), and R. Robertson (Bristol); and for Gas Supply, Messrs. S. B. Chandler, Assoc.M.Inst.C.E. (Tottenham), Stephen Lacey, B.Sc., Assoc.M.Inst.C.E. (London), A. B. Roxburgh (Newcastle-on-Tyne), and H. R. Hems (Birmingham).

GAS ENGINEERING.

Ordinary Grade.

From 2 to 5 p.m.

Sketches may be adopted to obviate long and involved statements.

The general neatness of the papers, including that of the sketches, and also lucidity of expression, will be taken into consideration in assessing marks.

(*Eight Questions set; six only to be attempted.*)

1. Sketch and describe any type of exhauster in general use.

2. (*a*) Explain how you would take samples for analysis of producer and waste gases from a horizontal setting.

(*b*) What would you expect to find the approximate analysis of a good producer gas and a good waste gas.

3. Sketch and describe any type of station governor with which you are familiar, and explain its working.

4. (*a*) Describe how you would test a sample of spent oxide.

(*b*) What percentage of sulphur on the dry basis would you expect to find in the spent oxide?

5. Describe with the aid of sketches any common method of heating a setting of horizontal retorts.

6. Explain and give the equations for the chemical reactions which take place

(*a*) in the removal of H_2S in an oxide purifier, and
(*b*) in the revivification of the fouled oxide.

7. Describe with the aid of a sketch a method for the continuous removal of tar from the hydraulic mains in a horizontal retort house.

8. (*a*) Sketch and describe a water gas plant generator.

(*b*) Explain and give the equations for the chemical reactions which take place in the generator during the blow and the run.

Higher Grade.

Part I., from 2 to 5 p.m.

(*Five Questions set; four only to be attempted.*)

1. (*a*) Sketch a stoking machine for horizontal retorts—one with which you are familiar.

(*b*) Briefly describe its working, and *your own views* on the points of advantage or disadvantage appertaining to it.

2. Sketch an outline of a small coal test plant, and describe how you would proceed to carry out a test of a gas coal, and the points to be reviewed in the results.

3. Discuss generally the effects on the products of distillation, and on the material of the retort setting itself by the employment in carbonizing practice of

(*a*) Low temperatures.
(*b*) High temperatures.
(*c*) Unduly high temperatures.

4. Sketch a retort house governor, and describe:

(*a*) Its functions and necessity.
(*b*) The points to be observed to maintain it in efficient working.

5. Describe *fully* the process of condensation, giving the different methods that can be employed to accomplish this process, and the reasons put forth for the adoption of such plant.

Higher Grade.

Part II., from 6 to 9 p.m.

(*Five Questions set; four only to be attempted.*)

6. Sketch an *outline* of a carburetted water gas plant, showing the principles now being employed to obtain as much steam as possible from the "sensible" and "waste heat" of the plant in its working cycles.

Briefly discuss the advantages of the sources of such steam production, and compare the possible quantities of steam available as between a "blue" gas and carburetted water gas plant.

7. Sketch the apparatus used and fully describe the method adopted for testing a sample of spent oxide for sulphur content.

State what precautions have to be taken to ascertain the "true pure" sulphur content of the oxide. State what other compounds besides sulphur you would expect to find in spent oxide from coal and carburetted water gas purifiers.

8. Apart from the ordinary blade type exhauster, describe an alternative mechanical plant that is used for exhausting or pressure-raising purposes.

9. Describe the cause and formation of scurf in fireclay retorts. Describe methods and periods of de-scurfing.

(*a*) A horizontal retort.
(*b*) Two methods for vertical retorts.

10. Give the reasons why it is necessary to test regularly and carefully the outlet gas going to the town, for:

(*a*) Sulphuretted hydrogen.
(*b*) Ammonia.
(*c*) Calorific value.
(*d*) Specific gravity.

Diploma.

Part I., from 2 to 5 p.m.

(*Five Questions set; four only to be attempted.*)

1. State fully how you would work a producer, designed to heat a setting of ten horizontal retorts, to obtain the highest quality producer gas, and give the analyses of producer gas immediately before and after cleaning the fire and mid time between the cleanings.

State what you consider to be the best working conditions (for horizontal retorts) for producing the maximum thermal yield per ton of coal, consistent with obtaining a low net cost of gas into holder. Mention the chief points and conditions which affect the net cost.

2. State the type of carbonizing plant you would recommend for a works at which 60 p.ct. of Durham coals would be carbonized.

Discuss fully the reasons for your recommendation.

Compare verticals and horizontals from the point of view of

(*a*) Quality and quantity of residuals.
(*b*) Life in working days before resetting is necessary.

3. In the removal of ammonia from coal gas by water, state the maximum strength it should be possible to work up the ammoniacal liquor, and the minimum quantity of water necessary to reduce the ammonia in the gas to 5 grains per 100 c.ft.

Give a diagram indicating the retort house hydraulic main, exhausters, condensers, washers, and circulating system, and describe the conditions and arrangements to ensure this result.

4. State the advantages of using silica retorts compared with fireclay.

State the examination you would subject silica material to before using same, also the precautions you would use in building a setting with this material, and the procedure you would employ for heating the setting on picking up, mentioning the "critical" temperature.

5. Describe a waste-heat boiler (*a*) requiring induced draught, (*b*) that is worked on natural draught, stating the height of the chimney.

State in each case the loss of draught through the boiler and the advantages and disadvantages. What proportion of the output of steam from a boiler requiring induced draught would be absorbed by the steam-driven fan, and what method could be adopted to compensate for the steam thus lost?

Diploma.

Part II., from 6 to 9 p.m.

(*Five Questions set; four only to be attempted.*)

6. Describe a modern carburetted water gas plant.

Give a description and details of how you would operate the plant

(assume the gas producing capacity of the unit to be of a size with which you are familiar), to obtain a gas of 470 B.Th.U. calorific value, stating the quantities of air, steam, and oil you would use, and the efficiency you would expect to obtain, from 1000 lbs. of coke and per gallon of oil.

Give your method of calculating these efficiencies.

7. Assuming steam the source of power for mechanically handling coal and coke, and for exhausting, washing, pumping, and other purposes (to be defined) on a gas-works, state the proportion of steam used for the various purposes and the steam distribution losses in such works. What steps should be taken to reduce steam distribution losses to a minimum?

What would be the cost of generating electricity on a gas-works from:

(1) Steam (from low-grade fuel at 15s. per ton).
(2) From gas on works (at 6d. per therm).
(3) From waste heat?

Show in detail how such costs are arrived at.

8. Discuss the question of dehydration of town gas.

Describe fully a method adopted for this purpose, stating at what stage in the manufacturing process such elimination should take place.

9. Considerable attention has been given to low-temperature carbonization in the Public and Technical Press. Discuss the claims made in favour of low-temperature carbonization, and compare and value the therms and residuals per ton of coal carbonized with low-temperature carbonization and in modern gas-works practice.

10. Describe fully and give the chemical reaction that takes place in softening water for boiler feed in

(*a*) A lime and soda plant.
(*b*) A "Permutit" plant.

Discuss the advantages and disadvantages of each method, and the comparative cost of each process per 1000 gallons of water softened, stating the quantity and price assumed for reagents in arriving at such costs.

Give particulars of the tests that should be made to ascertain that the water in the boiler is satisfactory, and the method adopted to rectify the quality.

GAS SUPPLY.

ORDINARY GRADE.

From 2 to 5 p.m.

Sketches may be adopted to obviate long and involved statements. The general neatness of the papers, including that of the sketches, and also lucidity of expression, will be taken into consideration in assessing marks.

(*Eight Questions set; six only to be attempted.*)

1. Explain with the use of chemical equations the formation of water as a product of combustion of town gas, and discuss its practical significance.

2. A 12-in. main 1000 yards long is being tested for soundness under air pressure. The pressure falls from 5 in. of mercury to 4·5 in. in 3 hours. Calculate the volume of air (corrected to atmospheric pressure) that has escaped, assuming that the barometer remained stationary at 29·5 in.

3. Describe with sketches a gas-heated water circulation system which permits of either a small or a large quantity of stored water being heated to, and maintained at, a predetermined temperature.

4. There is reason for thinking that a consumer's meter is not registering gas accurately. How would you investigate this without removing the meter, and what defects would you look for?

5. Describe with sketch what you consider to be a good form of flueless heating stove, and give your reasons.

6. Two pints of water are heated from 60° Fahr. to boiling-point in a kettle placed on a cooker hotplate. With one form of bar 2 c.ft. of gas is sufficient, but with another 2½ c.ft. of gas is required.

Calculate the thermal efficiency in each case.

The gas has a calorific value of 470 B.Th.U. per c.ft.

7. Sketch and describe a street gas lamp. What material would you recommend for the external parts, and what would you estimate to be the life of the mantles in burning hours?

8. Discuss generally the advantages and disadvantages of town gas as an industrial fuel.

HIGHER GRADE.

Part I., from 2 to 5 p.m.

(*Six Questions set; five only to be attempted.*)

1. Set out an approximate analysis of dry gas with a calorific value of 500 B.Th.U. per c.ft.; and calculate the weight (in lbs.) of water produced by the combustion of 1000 c.ft. of the gas.

The weight of 1000 c.ft. of hydrogen is 5·29 lbs.

2. Gas is delivered from A to B, a distance of 3 miles. The first 2 miles is of 24-in. pipe, the last mile being 18 in. A and B are 50 ft. above datum, and C (the point where the main changes in diameter) is 120 ft. above datum.

The pressure at A is 12 in. water gauge and at B it is 4 in. water gauge? What is the pressure at C?

Assume the specific gravity of the gas to be 0·5 as compared with air, and the specific gravity of water to be 800 as compared with air.

3. State fully the circumstances that favour the use of a governor on the outlet of a consumer's meter. How would you determine the correct loading of the governor in a particular case, and what instructions would you give the fitter to ensure the best adjustment of all the gas appliances?

4. Enumerate the appliances you would instal for testing meters in accordance with the Measurement of Gas Act. What are the requirements of the Act, and how are the statutory tests made?

5. Two miles from the gas-works of a small town a building estate for 200 houses is being developed. There are to be about eight houses to the acre.

The houses are to be carcassed for gas lighting, a cooker, a wash-copper, and a gas fire in one bedroom.

Give your estimate of

(1) the total annual gas consumption, and
(2) the maximum hourly rate of consumption.

Also state what considerations you would take into account when determining the sizes of the mains to be laid to and on the estate.

The price charged for gas is 10d. per therm.

6. What do you understand by the term "flame temperature?" Explain as fully as you can its significance in the application of gas to domestic and industrial processes.

What would you consider to be the relative temperatures of the flames of a low-pressure cluster lamp and a high-pressure lamp, basing your calculation upon their relative lighting efficiencies?

HIGHER GRADE.

Part II., from 6 to 9 p.m.

(*Six Questions set; five only to be attempted.*)

7. Describe with sketches what is meant by

(1) direct lighting;
(2) semi-indirect lighting.

Give typical polar curves of units suitable for each of these methods of lighting, and describe the circumstances that would favour the use of each.

State the amount of illumination you would provide for classrooms in schools.

8. What are your views regarding the use of flue equipment with

(*a*) Cooking stoves.
(*b*) Circulating boilers.
(*c*) Geysers.

Give sketches of the arrangements and specify the materials you would recommend for this purpose.

Give reasons for your answers.

9. With a modern gas cooker before you, how would you practically illustrate each of the following terms: Radiation, convection, conduction, latent heat, and thermal insulation.

10. A factory manager requires 50 B.H.P. in one unit and wishes to compare the relative advantages of using town gas, oil, and electricity.

How would you compare the three alternatives, choosing your own data as to price of fuel, capital costs, load factor, &c.?

11. Give a sketch showing a section of a gas-heated oven furnace such as would be used for annealing operations in works practice.

State the method of heating and operation.

What temperatures would you expect to obtain with a furnace of the design you have described, and how would these temperatures be ascertained?

What would be the approximate gas consumption of a particular size of the furnace?

12. Describe the construction of any gas-operated refrigerator with which you are familiar. Explain the physical principles on which its action depends. What would you expect the gas consumption to be per day, assuming the refrigerator is used for domestic purposes?

DIPLOMA.

Part I., from 2 to 5 p.m.

(*Four Questions set; three only to be attempted.*)

1. What arguments are used by the advocates of "panel" heating? Discuss this system of heating in relation to your own views of the ideal way of warming buildings—domestic and otherwise.

2. The economic possibilities in the use of gas can only be fully realized on the condition that gas undertakings largely accept responsibility for the installation and maintenance in good condition of gas appliances. Discuss this statement in the light of your own experience.

3. Many gas undertakings have increased their industrial heating load to a considerable extent in recent years. To what reasons is this development attributable? Discuss briefly future possibilities.

4. The institution of rental terms for gas apparatus is contemplated by a company which heretofore has only sold appliances. What considerations should be borne in mind in framing a hiring list, and what scheme would you institute for the maintenance of the apparatus in an efficient state throughout the term of life, and how would this affect the rental rates?

DIPLOMA.

Part II., from 6 to 9 p.m.

(*Four Questions set; three only to be attempted.*)

5. Describe as briefly as possible your ideas for workshops of the distribution (or gas service) department of a company with an output of 500 millions per annum.

State what work you would expect to carry out, and the staff required.

6. If a builder engaged on a scheme for the erection of 500 houses sought your advice regarding the provision of flues, what would you recommend? Your answer should have reference to fires, water heaters, and cookers, and the mistakes often made by builders in flue construction.

7. State the difference between radiant and convected heat in such a way as would make it readily clear to a non-scientific consumer having no knowledge of the subject; and, in so doing, show the application to the arguments in favour of gas for heating houses.

8. What is the difference between

(*a*) a multi-part tariff system of charge;
(*b*) a "block" tariff system of charge; and
(*c*) a system of charge based upon discounts?

Which system would you recommend, and why?

MANCHESTER METER TESTING.

The Official Inspector of Gas Meters for the City of Manchester (Mr. Arthur Winterbottom) has submitted to the Lord Mayor and Magistrates of the city the report of the City Justices' Gas Meter Testing Department for the year ended March 31.

The number of meters tested during the year amounted to 83,215, showing an increase of 930 as compared with the previous year. The fees charged amounted to £4755; total receipts being £4815. Of the meters tested, 3578, or 4·29 p.c., were rejected. Of the wet meters tested—viz., 4644—189, or 4·06 p.c., were rejected; and of 78,571 dry meters tested, 3389, or 4·31 p.c., were rejected. The number of prepayment meters tested during the year was 51,823; the remaining 31,392 being meters of the ordinary type.

Cause of Error in Meters Rejected.

—	Leaking.		More than 2 P.Ct. Fast.	More than 3 P.Ct. Slow.	Passes Gas without Registering.	Will not Pass Gas.	Excessive Absorption of Pressure.	Other Faults.	Total.	P.Ct.
	External.	Internal.								
New wet meters.	7	1	7	1	2	..	1	2	21	1·27
Old wet meters.	38	16	39	1	13	7	7	47	168	5·60
New dry meters.	48	126	200	149	10	22	27	8	590	1·44
Old dry meters.	226	596	1259	357	61	78	112	110	2799	7·43
	319	739	1505	508	86	107	147	167	3578	..

CO-PARTNERSHIP IN THE GAS INDUSTRY.

In the course of a visit to Plymouth in connection with a co-partnership conference, Mr. E. W. Mundy, Secretary of the Industrial Co-Partnership Association, stated that the Plymouth and Stonehouse Gas Light and Coke Company is the only firm in the town which has so far adopted co-partnership; the Company's scheme having been in operation since October, 1924. It is a dual scheme of co-operation and superannuation, the objects of which are to unite the interests of the employees and the Company, to encourage thrift, and to make provision for old age; and the scheme is much appreciated by the employees. Bonuses are granted to members of the scheme, which embraces all the employees, at the same rate as the shareholders receive in dividend on the ordinary stock. Out of this bonus the member has to contribute his liability to a superannuation fund, and the Company contributes an equivalent amount. The member has to be a shareholder, holding a minimum of £5 of stock in the Company; and many hold stock considerably in excess of that amount. After those conditions have been complied with, the balance of the bonus standing to the credit of the co-partner bears interest at 5 p.c., and is withdrawable.

Regarding co-partnership, the rules provide that the bonus shall be calculated on the total remuneration earned by the co-partner in the course of the year, except for the payment of overtime. Bonus is calculated at the same rate as that of the average dividends on the ordinary stock of the Company for the two preceding half-years, with a minimum bonus of 5 p.c. Employees who have been in the service of the Company for six months are entitled, if they so desire, to join in the benefits of the scheme.

The Co-Partnership Committee is composed of the Chairman of the Board of Directors, six members elected by the Directors, and six elected by ballot by the co-partners from among those of their number who have been at least five years in the Company's service.

Under the superannuation fund rules, each co-partner is required to pay a contribution, calculated on the same basis as that of the bonus, of 3 p.c. if not over thirty years of age on becoming a member, and of 4 p.c. if over 30. At the end of each year the Company contributes to the fund a sum equal in amount to the contributions of members, and guarantees the solvency of the fund. The compulsory age of retirement on pension is fixed at 65; and if by mutual agreement a member continues in the service, his contributions and those of the Company cease at that age.

Mr. Mundy stated that throughout the country 53 gas companies were participating in profit-sharing schemes, and more than half the capital in gas companies was owned by profit-sharing firms. Workers in these companies had drawn total profits of nearly three million pounds since the various schemes were adopted (beginning some 26 years ago), and the amount of the shares held by employees exceeded two million pounds.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDER.

Worksop Gas Company.

To authorize the Company to raise additional capital; to provide that the sliding-scale shall be on the basis of the price charged for gas in the several quarters of the year or half-year; to empower the use of scheduled land for gas purposes; to authorize profit sharing; and for other purposes.

Owing to a serious loss on the Letterkenny (Co. Donegal) Gas-Works, the works are to be closed down during the summer months.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There has been a slightly easier tone in the market during the past week. The prompt position in most cases is fairly satisfactory, but forward business is still hanging fire, and inquiry might be better. Collieries generally are still holding out for recent prices, with the intention of reducing output rather than taking less; but merchants are inclined to discount prices in order to secure business abroad.

Wear Special gas makes are quoted steadily at 15s. 6d. to 16s., and bests are 15s. to 15s. 3d. f.o.b. Seconds are 13s. 6d. to 13s. 9d., with some ordinaries obtainable at 13s. Gas coals have been in quite good demand; but coking has been quieter, though nominally still 13s. 6d. to 13s. 9d. Durham bunkers are steady, especially best brands, which ask 14s. 6d. to 14s. 9d. Northumberland best screened steams are well booked, and all classes hold to the agreed minimum prices, from 13s. 6d. down.

Coke of all kinds is weak, and stocks are inclined to accumulate. Very little trade is passing, and gas makes are called 19s. to 19s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

The majority of gas concerns appear to have bought well ahead; the figures for recent business being in the neighbourhood of last year's quotations. Some concerns have anticipated the market, and the effects are somewhat problematical. Generally speaking, however, the advances for gas fuel will be up to 2s. per ton.

The general trade in industrial fuel is at the moment on the quiet side. The chief discussion among traders throughout the Midlands relates to the Five Counties Scheme, which is operating in accordance with the position regarding supply at each colliery. Figures, therefore, for washed fuels are rather spasmodic, and it will be some time before there is a general stabilized basis of prices.

The export situation is rather difficult at the moment, as the restricted outputs do not permit of business now being put forward. As the question has been raised in Parliament, some notice will be taken with the probable result of a re-allocation more suitable to the trade during the next few weeks.

MIDLANDS.

There is no material change in the general poise of the market. The effect of the Five Counties Scheme is to bring about shortages in particular descriptions of coal at individual collieries. This is taken as a warning as to what may happen; but thus far it has been possible for middlemen to supply deficiency in one direction from superfluity in another direction without any apparent disturbance of the general balance.

Buyers are accordingly firm in their resistance to endeavours to raise prices against them. The price level is, however, no longer subject to the irregularities which formerly weakened the hands of sellers. It is recognized that with further reduction of output the strain must become appreciable. Consumers have been aided by the disappointing volume of exports from the Humber ports. This has meant that supplies have been forced inland. Hence the first month's working of the control did not modify the relation of supply and demand to the extent expected.

It has become evident that a supreme attempt is to be made to secure higher prices. A number of Midland collieries have sent out notifications of all-round advances amounting to 1s. or 1s. 6d. Concerns outside the scheme have made no move. There does not appear to be any great urgency of demand.

CONTRACTS OPEN.

Coal.

The Gas and Water Committee of the Devizes Corporation invite tenders for the supply of coal. [See advert. on p. 342.]

Pipes and Welding, &c.

The Gas Department of the Borough of Chesterfield invite tenders for the supply of weldless steel tubes, &c., also for welding and testing. [See advert. on p. 342.]

TRADE NOTES.

Heat Saving in Industry.

The practice of preheating the air for combustion has become a recognized feature of modern power plant practice. Howden-Ljungstrom preheaters are being installed at the new power plant for Synthetic Ammonia and Nitrates, Ltd., at Billingham. In this case the preheaters will have an efficiency of slightly over 68 p.c., and the temperature of the air will be 500° at normal load and 520° at maximum load; the entering gas temperatures being 600° and 640° respectively. The Shanghai Municipal Council installed four Howden-Ljungstrom regenerative preheaters in 1926, and as the result of their satisfactory performance have since ordered one for a new Stirling boiler fired with pulverized fuel which is being put in this year, and two further preheaters for two 100,000 lbs. per hour boilers in the original boiler house.

The Directors of the Montevideo Gas and Dry Dock Company, Ltd., recommend a final dividend of 3½ p.c., free of income-tax, on the ordinary stock of the Company, for the year ended Dec. 31, 1927, payable on May 23, and making with the interim dividend a total of 6 p.c. for the year—the same as for the previous year.

News Items Continued on p. 338.

STOCK MARKET REPORT.

ANIMATION and strength prevailed in most of the stock markets last week. Each day business commenced before the official opening and continued until a late hour. The chief interest was centred in Industrials, but there were some interesting features in other sections. As was anticipated, the listing of the 5 p.ct. War Loan on the New York Exchange followed the listing of the 4 p.ct. Funding Loan, but there was no apparent effect on the price. Home Rails improved on the Budget proposals, but quietened down towards the close.

The usual sedateness of the Gas Market was quite upset. Purchases in the past have mostly been confined to investors with a particular knowledge of the industry, but the recent activity has been mainly due to heavy buying by American Trust companies. It is a curious fact that it should be left to foreign investors to recognize the attractions of gas securities, the yield on which on the average is much higher than the yield on other public utility undertakings. Quite a bunch of quotations were marked up during the week; the most noticeable being a rise of 6 points in the Imperial Continental ordinary, making 9½ points in a fortnight. The Uxbridge ordinary and preference were marked up 2 and 2½ points respectively. This Company is offering £50,000 5 p.ct. perpetual debenture stock for sale by tender, the minimum price being £94 per £100, showing a yield of £5 6s. 5d. p.ct. A very attractive stock is the Hornsey 3½ p.ct. ordinary, which, though closely held, can occasionally be picked up if instructions are left with a broker. The yield on the present 5 p.ct. dividend is nearly £6 6s. p.ct.

The following transactions were recorded during the week:

On Monday, Aldershot 4 p.ct. preference 71¾, Alliance and Dublin 94½, 95, Bournemouth "B" 7 p.ct. £12 9s. 3d., Brighton and Hove 6 p.ct. Standard 117½, Cardiff 7½ p.ct. debenture 102½, Commercial 3 p.ct. debenture 59¾, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 6½d., 18s. 6¾d., 18s. 7½d., 3½ p.ct. maximum 63½, 65, 4 p.ct. preference 78½, 3 p.ct. debenture 61½, 62, Imperial Continental 159, Primitiva 27s., 27s. 3d., 27s. 4½d., 27s. 6d., 27s. 7½d., 27s. 9d., 27s. 10½d., 28s., 28s. 3d., 28s. 6d., South Metropolitan 104¾, 105¾, 3 p.ct. debenture 60¾, 6½ p.ct. debenture 100½, Tottenham "B" 94. Uxbridge 5 p.ct. 92, Wandsworth "B" 112½. Supplementary prices, Bath 88½, British, Hull 3½ p.ct. debenture 63½, Liverpool 5 p.ct. 88¼, Wandsworth 5 p.ct. debenture 100.

On Tuesday, Brighton and Hove 5 p.ct. 105, 106, European 8½, Gas Light and Coke 18s. 4½d., 18s. 6¾d., 18s. 7½d., 3½ p.ct. maximum 64, 4 p.ct. preference 78½, Imperial Continental 160, Montevideo 93, Primitiva 27s. 3d., 27s. 6d., 27s. 7½d., 27s. 9d., 27s. 9¾d., 27s. 10½d., 28s., 28s. 1½d., 28s. 3d., 28s. 4½d., Sheffield "B" 100¾, "C" 100¾, South Metropolitan 105½, South Suburban 5 p.ct. 105, Tottenham "B" 95, Wandsworth 4 p.ct. debenture 76. Supplementary prices, Brighton and Hove 5 p.ct. debenture 96½, Croydon 4 p.ct. debenture 79¾, Pinner 5¼ p.ct. debentures 101, Wandsworth 5 p.ct. debenture 100¼.

On Wednesday, Aldershot 4 p.ct. preference 71, Alliance and Dublin 94½, Bristol 5 p.ct. 87, Commercial 99, 100, Continental Union 29½, 30, European 8 1/16, Gas Light and Coke 18s. 3d., 18s. 4½d., 18s. 6d., 18s. 7½d., 3½ p.ct. 64¾, 3 p.ct. debenture 61½, 61¾, Newcastle 4 p.ct. preference 67⅞, Primitiva 27s., 27s. 7½d., 27s. 9d., 27s. 10½d., 28s., 28s. 1½d., 28s. 3d., South Metropolitan 105, 105¼, 105½, South Suburban 5 p.ct. 107½, 5 p.ct. debenture 95, Tottenham "B" 93½, Uxbridge 5 p.ct. 95. Supplementary prices, Grays and Tilbury "B" 9⅜, 9⅞.

On Thursday, Barnet 7 p.ct. 110, Bournemouth "B" 12 5/16, Brighton 5 p.ct. 105, Colonial Gas Association 23s. 9d., 8 p.ct. preference 21s. 6d., Gas Light and Coke 18s. 6d., 18s. 9d., 4 p.ct. preference 78¾, 79½, 79⅛, 3 p.ct. debenture 61¼, Imperial Continental 162¼, 162½, Montevideo 94, Primitiva 27s. 9d., 27s. 10½d., 27s. 11½d., 28s., 28s. 1½d., 28s. 3d., 28s. 4½d., 4 p.ct. 1st debentures 94, South Metropolitan 105, 105¾, South Suburban 5 p.ct debenture 95. Supplementary prices, Chester United 88¾, Croydon 4 p.ct. debenture 79¾, North Middlesex 5 p.ct. preference 86.

On Friday, Alliance and Dublin 95½, Bournemouth 7 p.ct. 12½, Gas Light and Coke 18s. 6d., 18s. 7½d., 18s. 8d., 18s. 9d., 3½ p.ct. maximum 65, 3 p.ct. debenture 61¼, Newcastle 4 p.ct. preference 66½, Primitiva 27s. 9d., 27s. 10½d., 28s., 28s. 1½d., 28s. 3d., 28s. 4½d., South African 5, South Metropolitan 105½, South Suburban 105, 106½, 107½, Swansea 7 p.ct. preference 101 11/16. Supplementary prices, Exeter 5 p.ct. debenture 95s., Grays and Tilbury new 5 p.ct. debenture 95½, 96, Southend-on-Sea 4 p.ct. debenture 75.

The anticipated rise in the New York bank rate did not take place last week, and there was a consequent fall in discount rates in Lombard Street. Monetary conditions were on the whole quite comfortable. Old day-to-day loans were renewed at 3½ p.ct., and fresh accommodation was obtainable at from 3½ p.ct. down to 3¼ p.ct. A sharp drop occurred in the rate at which Treasury Bills were allotted; the average being £3 18s. 5·49d. p.ct., or 2s. 8d. below the previous week's rate.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2¼ p.ct. at call and 2⅝ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 27.	Rise or Fall on Week.	Transaction Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 9	5	5	Aldershot 5 p.c. max. C.	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	..
1,551,868	,,	Apl. 12	7	7	Alliance & Dublin Ord.	93—96	..	71—71¾
874,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb.	64—67	..	94¼—95½
522,654	,,	Mar. 8	7	7	Barnet Ord. 7 p.c.	109—112	..	..
800,000	1	Apl. 26	1/7½	1/7½	Bombay, Ltd.	21/—22/•	—1/.	110
170,000	10	Mar. 8	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
800,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	..
375,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11	..	12 5/16—12½
50,000	Stk.	Jan. 12	3	3	Do. 5 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..
357,900	,,	Mar. 8	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	..
341,880	,,	,,	6/8/6⅔	6⅔	Do. 5 p.c. Con.	103—106	..	117½
1,387,500	,,	Feb. 23	5	5	Bristol 5 p.c. max.	87—88a	..	105—106
865,000	,,	Mar. 22	8	7	British Ord.	118—116	..	..
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref.	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—75	..	..
200,000	,,	,,	—	33/2	Do. 5 p.c. Red. Deb.	93—96	..	..
100,000	10	Nov. 24	8	6	Cape Town, Ltd.	8—9	..	..
100,000	10	Apl. 26	4½	4½	Do. 4½ p.c. Pref.	6½—7½•	..	..
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb.	72—77	..	..
626,860	,,	Feb. 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	,,	Jan. 12	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	,,	Feb. 23	5	5	Chester 5 p.c. Ord.	87—92b	..	103½
79,185	1	Apl. 26	†2/-	†2/-	Colombo Ltd. Ord.	31/—33/•	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/•	..	..
375,402	1	Apl. 12	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	23/—25/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	23/9
2,073,280	Stk.	Feb. 23	5	7	Commercial Ord.	98—101	+1	21/6
475,000	,,	Dec. 22	8	8	Do 8 p.c. Deb.	58—61	+1	99—100
800,000	,,	Sept. 29	†1	†1	Continental Union, Ltd.	29—34	..	58½
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref.	88—93	..	29½—30
787,560	,,	Mar. 8	6½	7	Croydon sliding scale	105—108	..	..
408,100	,,	,,	5	5	Do. max. div.	81—84	..	..
492,270	,,	Mar. 8	7	10	Derby Con.	110—115e	..	..
55,000	,,	Dec. 22	4	4	Do. Deb.	71—78e	..	..
209,000	,,	Mar. 8	5	5	East Hull Ord. 5 p.c.	76—79	..	..
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,002,180	10	Mar. 22	†4	†6	European, Ltd.	8—9	..	..
13,703,480	Stk.	Feb. 9	5	5/1/4	Gas Light & Coke 4 p.c. Ord.	18/6—19/-/f	+·/1½	8 1/16—8⅜
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	63—65	..	18/6—18/9
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	63¾—65
5,609,620	,,	Dec. 22	3	3	Do. 3 p.c. Con. Deb.	60—62	..	79¾—79½
181,315	,,	,,	6	6	Do. 6 p.c. Br'd'f'd Rd. Db.	102—105	..	61½—62
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	99—101	..	..
43,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 8	6⅔	6⅔	Hastings & St L. 5 p.c. Conv	87—90	..	..
258,740	,,	,,	5½	5½	Do. 8½ p.c. Conv.	68—71	..	..
70,000	10	Apl. 26	†10	†10	Hongkong & China, Ltd.	18½—14½•	..	..
173,200	Stk.	Mar. 8	5	5	Hornsey Con. 3½ p.c.	78—81	..	..
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	160—165	+6	159—162½
223,130	,,	Feb. 9	8½	8½	Do. 8½ p.c. Red. Deb.	68—70	..	..
235,242	,,	Mar. 8	7	7	Lea Bridge 5 p.c. Ord.	94—97	..	..
2 145,907	,,	Feb. 23	5½	5½	Liverpool 5 p.c. Ord.	88—89b	..	..
600,000	,,	Mar. 22	7	7	Do. 7 p.c. Red. Pref.	101½—103½b	..	..
165,736	,,	Feb. 23	9	8	Maidstone 5 p.c. Cap.	108—111	..	..
75,000	5	Dec. 22	†7	†8	Malta & Mediterranean	5½—6	..	..
541,920	Stk.	Nov. 24	†7	†5	Montevideo, Ltd.	92½—94½	+½	93—94
2,061,315	,,	Mar. 8	5	5	Newcastle & Gateshead Con.	16/3—17/3df	+·/3	..
960,929	,,	,,	4	4	Do. 4 p.c. Pref.	66½—67½d	..	..
691,705	,,	June 29	8½	8½	Do. 8½ p.c. Deb.	66½—67½d	..	..
131,780	,,	Mar. 8	6/18/0	6/18/0	North Middlesex 5 p.c. Con.	97—100	..	..
800,000	,,	Apl. 26	9	7	Oriental, Ltd.	113—118•	—3	..
188,120	,,	Dec. 22	7½	7½	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,500	,,	Feb. 23	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	101—104	..	..
326,732	,,	,,	5	5	Do. 5 p.c. max.	77—80	..	..
2,334,464	1	—	—	—	Primitiva Ord.	27/6—28/6	+1/-	27/—28/4½
244,500	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	92—95	..	94
695,000	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	75—77	..	..
416,845	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb.	75—77	..	..
150,000	10	Mar. 22	6	6	San Paulo 5 p.c. Pref.	8—8½	..	..
135,000	50	Jan. 3	6	6	Do. 5 p.c. Red. Deb.	46—48	..	..
370,000	Stk.	Mar. 22	6	6	Sheffield A	160—102e	..	..
419,968	,,	,,	6	6	Do. B	100—102e	..	..
1,047,000	,,	,,	6	6	Do. C	100—102e	..	..
90,000	10	May 26	4	6	South Africa	4—6	..	5
6,609,895	Stk.	Feb. 23	5	7½	South Met. Ord.	104—106	..	104½—105¾
500,000	,,	,,	—	6	Do. 6 p.c. Irred. Pf.	109—112	..	..
1,895,445	,,	Jan. 12	8	8	Do. 8 p.c. Deb.	59—62	..	60¾
734,000	,,	Mar. 8	8½	8	Do. 6½ p.c. Red. Db.	100—102	+1	100½
91,500	,,	Feb. 23	8½	8½	South Shields Con.	112—114d	..	..
1,348,795	,,	Feb. 23	8½	8½	South Suburban Ord. 5 p.c.	105—108	..	105—107½
868,837	,,	Dec. 22	6½	6½	Do. 5 p.c. Deb.	95—98	+2	95
647,740	,,	Mar. 22	5	5	South'mpton Ord. 5 p.c. max	76—80	..	..
121,375	,,	Dec. 22	5	5	Do. 4 p.c. Deb.	72—75	..	..
350,000	,,	Mar. 22	4	4	Swansea 7 p.c. Red. Pref.	100—103	..	101½
200,000	,,	Mar. 8	7	7	Do. 6½ p.c. Red. Deb.	99—102	..	..
120,000	,,	Dec. 22	6½	6½	Tottenham District A 5 p.c.	112—117	..	..
882,275	,,	Feb. 23	7½	7½	Do. B 5½ p.c.	92—95	..	93½—95
150,000	,,	,,	6½	6½	Do. 5½ p.c. Pref.	98—101	..	..
181,255	,,	,,	5½	6½	Do. 4 p.c. Deb.	74—77	..	..
		Dec. 8	4	4	Uxbridge, Maidenhead, & Wycombe 5 p.c.	90—95	+2	92—95
289,094	,,	Mar. 8	6½	6 2/3	Do. 5 p.c. pref.	86—90	+2½	..
98,880	,,	,,	6	6	Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Mar. 8	8½	8½	Wandsworth A 5 p.c.	129—134	..	..
355,686	,,	,,	7	7	Do. B 5½ p.c.	111—116	..	..
432,535	,,	,,	5/19/0	5/19/0	Do. C and New	98—103	..	112½
352,000	,,	,,	6⅔	6⅔	Do. Wimbledon 5 p.c.	106—111	..	..
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	112—117	..	..
900,000	,,	,,	5	5	Do. 5 p.c. Pref	86—91	..	..
88,416	,,	Dec. 22	3	3	Do. 3 p.c. Deb.	57—60	..	..
284,748	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	76

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle e.—Sheffield. f.—The quotation is per £1 of Stock. • Ex. div. † Paid free of income-tax. ‡ For year.